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ABSTRACT

The goal of this handbook is to inform technology planning committee members about the dimensions of the technology planning and implementation process and to guide them through the process of aligning their technology plans with schoolwide reform efforts. Sections are included for each of the following dimensions: (1) develop a vision and policy; (2) analyze technology needs; (3) focus on student-centered learning; (4) involve parents and the community; (5) support professional development; (6) build a technology infrastructure; (7) establish multiyear funding; and (8) evaluate processes and outcomes. Tips from research, case scenarios focused on critical technology planning issues, suggested action steps, and Internet resources are included throughout the handbook. A toolkit for creating a technology plan is also provided that contains a worksheet for developing a vision, comprehensive needs assessment chart, student needs assessment worksheet, technology integration planning chart, basic technology terms crossword puzzle, parent technology survey, parent-community needs assessment worksheet, partners in learning with technology agreement, staff needs assessment worksheet, technology proficiency chart, technology resource needs assessment worksheet, technology resource usage policies template, and technology evaluation rubric. (Contains 67 references.) (MES)

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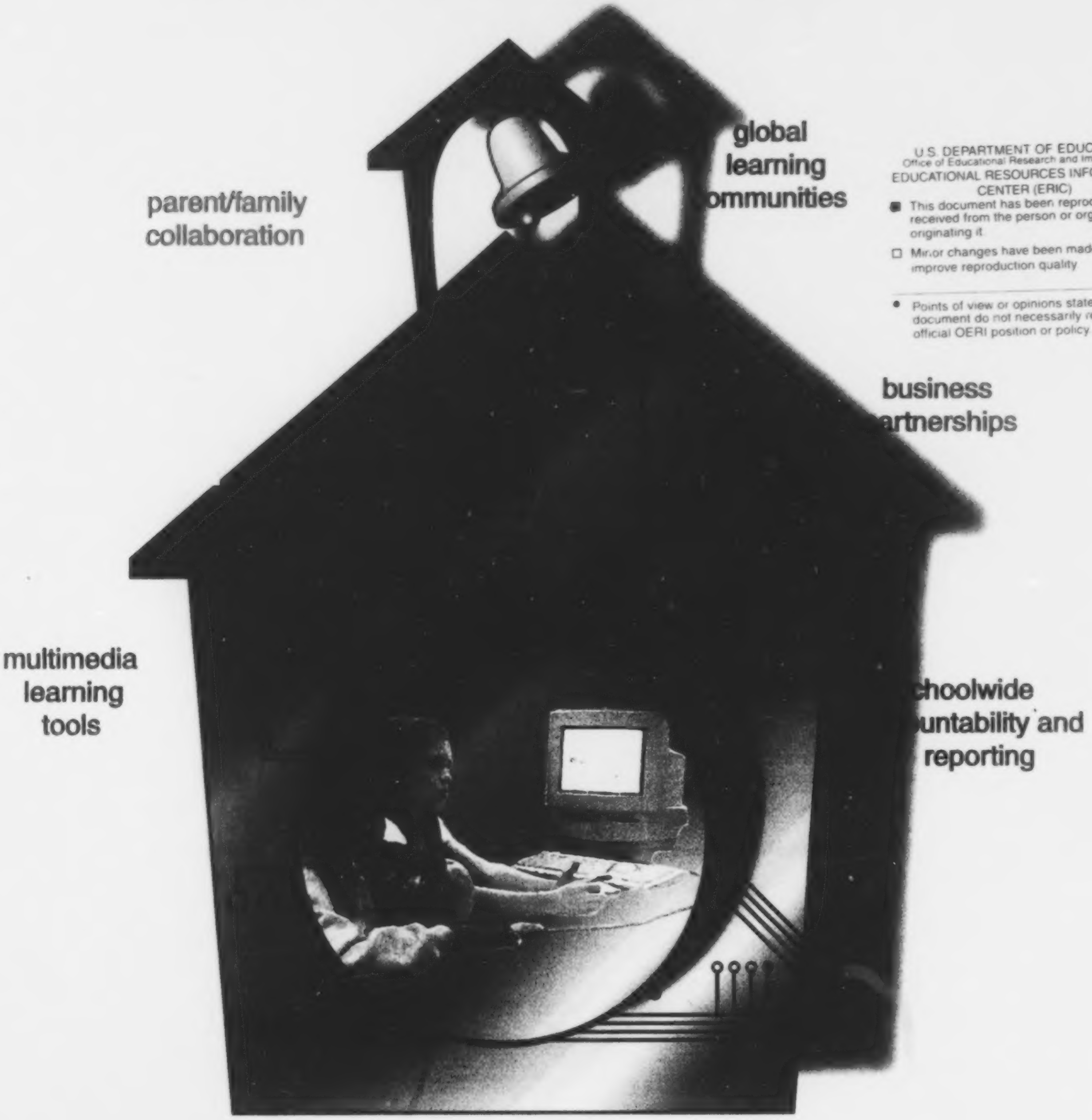
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Planners' Handbook

U.S. Department of Education

North Central Regional Educational Laboratory

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Technology Connections for School Improvement

Mary L. McNabb, Gilbert Valdez, Jeri Nowakowski, and Mark Hawkes
North Central Regional Educational Laboratory

U.S. Department of Education

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Introduction to the Handbook

Technology helps people learn, be creative, and become players and communicators in a global village. Technology, tied to the Internet, allows students of all ages to engage in knowledge building on a worldwide stage as never before possible. Many learning opportunities may never reach students in high-poverty or isolated schools except through the use of technology.

In this document, references to the word "technology" are limited to computers or other learning tools that require access to digital microchips.

In many settings, educators, family members, supportive human services providers, and other community members are considering how technology can assist in implementing schoolwide improvement plans. Across the nation, these improvement efforts set high standards for all students, draw on challenging content, and require engaging instructional strategies. Technology can be used to individualize instruction and provide a range of learning experiences from remediation to enrichment. Technology also can provide easy access to vast resources. Parental and community support are key to facilitating school improvements, including planning for and implementing technology. Schools, through technology resources and telecommunication, can make that involvement with parents more informed, immediate, and meaningful.

It is important that technology planning be guided by a collaborative vision about the desired learning outcomes recognized by a school and its community. Furthermore, work with a number of school technology planning committees reveals that the best technology plans have the following characteristics:

- Technology skills are defined for all students, and strategies for achieving them are integrated into the curriculum.
- Technology is designed to improve both the quality of curriculum available to students and the instructional methods used to teach them.
- Technology is designed to permit teamwork, allowing students to engage in joint projects with their classmates and with students from other states and regions.
- Technology is used to improve learning by offering more hands-on practice, more time, more content, more problem-solving, and more individualized planning.

It is the ability of all students—no matter whether rich or poor, or whether they are from a small town, a city, a rural area, or a suburb—to learn at the highest levels with the greatest resources and have the promise of a future of real opportunity. This is the potential of technology.

Richard W. Riley, July 29, 1998,
Technology and Education: An Investment in Equity and Excellence

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Who is this handbook for?

This technology planning handbook is designed for those who seek to:

- ✔ *Engage stakeholders in a process to enhance learning opportunities and experiences for those in their school community.*
- ✔ *Learn from research findings and case scenarios about problem-solving technology practices implemented in schools today.*
- ✔ *Identify technology needs and evaluate implementation progress.*

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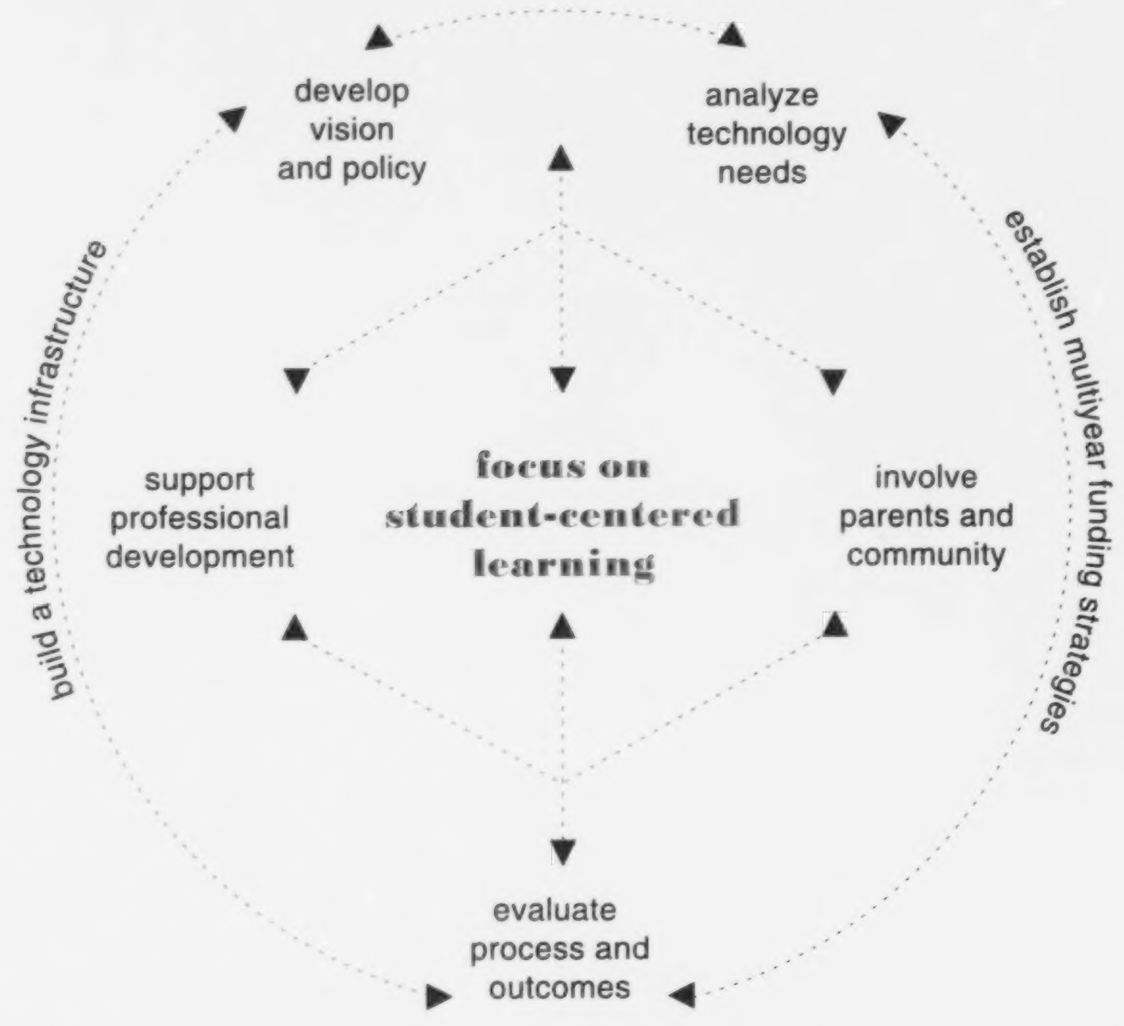
Further, a technology plan:

- Allows students to access information that interests them, yielding learning experiences that increase motivation and attendance.
- Reflects the level and kind of reform in the school—neither moving past, nor failing to encourage, present reform momentum.
- Provides new avenues for increasing the positive involvement of family and community members in education.
- Outlines strategies to train all teachers to use technology effectively.
- Connects the school to important organizations and resources, including museums, universities, community groups, and health and social services agencies.

Technology Connections for School Improvement describes eight overarching dimensions of the technology planning and implementation process (see Figure 1). The goal of this handbook is to inform technology planning committee members about these eight dimensions and to guide them through the process of aligning their technology plans with schoolwide reform efforts. On the pages ahead, you will find tips from research, case scenarios focused on critical technology planning issues, suggested action steps, Internet resources for becoming more informed, and a Toolkit for creating a technology plan that will help students of all ages meet their learning needs, expand their learning opportunities, and enrich their learning experiences.

If technology is to help educators and communities realize the overall goal of school improvement, we must change in three ways:

1. We must move from primarily stand-alone hardware in schools to connectivity—linking computers throughout the school, the community, the state, and even the world.
2. We must move from using technology for isolated skills-practice to integrating technology throughout the curriculum to achieve higher standards and more effective teaching.
3. We must move from having a few technology-skilled staff members to having all teachers prepared to use technologies effectively in their everyday teaching and staff development (Hawkins, 1998, p. 9).



MultiDimensional Technology Planning Process

develop vision and policy
analyze technology needs
build a technology infrastructure
establish multiyear funding strategies
support professional development
focus on student-centered learning
involve parents and community
evaluate process and outcomes

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Figure 1. Eight interconnected dimensions of comprehensive technology planning.

How can a school use this handbook?

A school or district technology planning committee can use this handbook: its initial planning phase or to address targeted topics to update an existing technology plan.

✓*To identify action steps and Internet resources for addressing critical issues in technology planning.*

✓*As a resource for technology coordinators, curriculum coordinators, teachers, and school administrators.*

Action Steps

For school communities just beginning to look at making reforms, it would be useful to order the following resources or access them on the Internet. These resources are especially helpful in aligning technology planning with schoolwide improvement efforts.

- *Plugging In: Choosing and Using Educational Technology* describes the foundational research and best practices of engaged learning, including indicators for student and teacher roles and technology (available online at http://www.ncrtec.org/capacity/plug/plug.htm and in print from the Educational Resources, (800) 624-2926).
- *Implementing Schoolwide Programs, Volume I: An Idea Book on Planning* describes research and successful schoolwide practices for high-risk populations with comprehensive standards-based educational programs supported by Title I (available from Policy Studies Associates, Inc. (PSA), 1718 Connecticut Avenue NW, Suite 400, Washington, DC 20009, (202) 939-9780).
- The *Pathways to School Improvement* Internet site provides rich resources on numerous topics affecting school improvement and includes multimedia insights from leading researchers and practitioners (available online at http://www.ncrel.org/pathways.htm).
- *Learning through Technology: A Planning and Implementation Guide* provides educators and community members with guidelines for developing a comprehensive learning and technology plan (available online at http://www.ncrel.org/tandl/homepg.htm).
- *The Research on Technology for Learning, Planning for Learning through the Use of Technology, and Implementing a Vision for Meaningful Learning* compose a series of interactive, multimedia CD-ROMs aimed at helping technology planning committees evaluate their progress toward using technology to enhance learning (available from the Association for Supervision and Curriculum Development, P.O. Box 79760, Baltimore, MD 21279-0760, (800) 933-2723 and online at http://www.ascd.org).

Develop a Vision and Policy

Objective

To develop a vision and policy for integrating technology into schoolwide improvement efforts based on the needs of learners in the 21st century.

Overview

Today's students must meet high academic standards. A critical step in helping students meet these new, rigorous standards is to create a vision that can guide school improvement planning. The use of technology in teaching, learning, and administrative functions should be a piece of that vision.

The vision that drives technology planning is the same vision that drives schoolwide improvement planning: the belief that all students can master diverse and challenging content, that teachers are motivated to seek professional development regarding innovative practices, and that districts will strive to coordinate resources across the whole school to give all students the support they need to achieve high standards. Policies should be designed to help implement the vision. A technology plan enables school staff and community partners to implement and enhance schoolwide improvements by focusing on the skills and knowledge students need for living and working in a technology-rich world.

Schoolwide improvement and technology planners must work in tandem to align new and expanded learning outcomes with the curriculum, instruction, and technology required to meet those outcomes. The most successful technology plans originate from a collective vision where the entire school community rallies behind them with funding, enthusiasm, and a hands-on effort toward connecting their classrooms, homes, and community resources to the global technology infrastructure.

> ***Learning is continuously enhancing the capabilities of a group of people to create their desired future. Learning is vision driven.***
>
> Charlotte Roberts,
> 1998 Keynote address at the
> NSDC Conference

Why Develop a Technology Vision?

The strategic use of technology starts with a vision about the schoolwide learning goals and standards necessary to prepare today's students for tomorrow's world. Technology is a wonderful resource, but it is only one component of a good school. Research indicates that schools with successful schoolwide practices also have:

- A record of improving student performance.
- Cohesive planning and implementation.
- Standards-based curricula.

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- Staff committed to building a community of learners.
- School, family, and community partnership supportive of improvement efforts.

(Policy Studies Associates, 1998)

Preassessment

1. Does your school have an existing or emerging schoolwide improvement plan?
2. Are technology and associated policies a part of that schoolwide improvement plan?
3. Are the technology skills that all students and teachers must develop clearly spelled out?
4. Will technology be available as an instructional tool for all students and teachers on an equitable basis?
5. Has your school or district involved key community stakeholders in planning for school improvement and technology implementation?

A technology vision for schoolwide improvement parallels these schoolwide practices. It describes how technology can enhance and extend each practice to meet better the needs of all students in achieving high standards.

Your technology vision should describe a future that is better than the present or past, yet be achievable in a reasonable amount of time. For example, your technology vision might depict your school as having expertise and resources in subject areas where it now has none. Or you may picture students with appropriate hardware, software, and connectivity to electronic networks being able to access information and cultural resources from new kinds of primary sources. You may see dedicated learners—young and old alike—using technology to increase the time, depth, and scope of their learning.

Many educators who have added a technology infrastructure to their schoolwide reforms have found the transformation in teaching and learning so profound that many of their learning requirements became obsolete. Textbook-driven reforms drag when compared to the knowledge, instructional methods, and engaged learning activities that the Internet's instantaneous access to volumes of up-to-the-minute information makes possible. Technology tools extend the amount and kind of knowledge and skills students learn. They increase relevant baseline

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skills, expand the amount and types of content available, and keep learners of all ages actively engaged in meaningful learning tasks and activities.

Plugging In (Jones, Valdez, Nowakowski, & Rasmussen, 1995) describes a technology vision in which technology opens up new opportunities for all students to become engaged learners. Who are the engaged learners? They are students who take charge of their own learning. Engaged students set their own learning goals to reach standards of excellence, demonstrate an active interest in creatively solving problems and making meaningful connections, and self-evaluate progress toward learning goals. They are strategic in applying technology knowledge and skills to authentic learning tasks. They collaborate. They value others and work with them to develop new ideas and understanding. And, they are energized by learning. For them, learning is itself a motivator that induces excitement and pleasure. (For more details on the relationship between engaged learning and technology, see *Plugging In* online at www.ncrtec.org/capacity/plug/plug.htm).

Students who are ready for the future know how to use technology effectively for a variety of purposes. Students who miss out on this learning opportunity miss out on vital life skills.

The equitable use of technology across schools and classrooms, and among students and teachers is a vital consideration in technology planning. Equitable expectations vary from school context to school context, depending on the amount and type of technologies available. Nonetheless, all schools and districts should have procedures for monitoring technology equity practices. The following are indicators of equitable technology practices:

- All students master basic technology literacy skills.
- All students have adequate hands-on technology time to complete their learning tasks and enhance their academic achievement.
- All students have access to up-to-date multimedia resources and telecommunications networks to support meaningful, engaged learning.
- All teachers, administrators, support staff, and parents have adequate hands-on technology time for meaningful professional development of technology literacy skills and curriculum integration methods.
- All teachers, administrators, support staff, and parents have access to up-to-date multimedia resources, telecommunications networks, and online records to support effective educational practices.
- All learners and facilitators of learning have timely access to knowledgeable technical support staff.

Why Use Technology?

✓ *To provide all students with appropriate technology literacy skills for 21st century citizenship, including social and economic prosperity.*

✓ *To facilitate and support student achievement of essential learning outcomes.*

✓ *To provide parents, community members, and staff with the tools and training necessary to support student achievement of essential learning outcomes.*

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For a detailed list of strategies for promoting equitable technology access, use, and curriculum integration in education, visit Northwest Regional Educational Laboratory's *Equity in Educational Technology* Web site (available at www.netc.org/equity/).

Who Should Be Involved in Creating a Technology Vision?

A technology plan must have the support of administrators, teachers, and influential community partners. Implementing a plan also entails creating new or revising existing policies related to professional development, school-family-community partnerships, and methods for evaluating and reporting processes and outcomes related to the impact of technology on student-centered learning. To that end, representatives from all facets of the community who have something to contribute to the future of children and the community should join with school personnel to create it. Administrators are crucial for facilitating the implementation of technology that alters physical facilities and operational policies. Teachers are essential in designing and implementing the plan, as it greatly affects their daily practices. Community partners such as parents, business representatives, and religious leaders are important in developing the philosophical, practical, and fiscal support for the plan as well as helping structure and implement new policies.

The membership of your technology planning committee should be representative of the populations in your school and/or district and gender balanced. Many districts and schools have successfully organized their technology planning committee using the following mix of team members:

- Two teachers from grades K-4, two from grades 5-8, and two from grades 9-12
- Representatives of the student body and of parents
- A media resources staff person
- A local board of education member
- Two administrators
- At least two community members (preferably with significant technology and cultural knowledge)
- At least one advocate for special populations
- A professional development coordinator
- A technical support staff person and/or consultant

A strategic mix of background knowledge and experience among committee members related to uses of technology will empower the team to move forward at a timely rate of planning and implementation.

Defining and Establishing Necessary Policy

Developing vision and goals is important. However, if appropriate supporting policies are not developed by people who determine governance and control technology resources, the vision and goals will likely never become a reality. School boards, superintendents, and principals need to pass and implement policies that define the expectations, governance, leadership, and usage rights for the technology infrastructure. Using materials adapted from the Washington State School Directors' Association's Passport to Leadership, the National School Board Association has developed a framework for setting policy (see *Effective Board Policy* www.nsba.org/sbot/toolkit/PolSet.html).

In actual practice, good policy addresses big-picture issues surrounding the implementation of a technology infrastructure, but does not get bogged down in details. Good policy provides parameters and direction for implementing and using technology, but is not an excuse for micromanagement. Effective policy provides orientation to appropriate technology implementation and usage methods, but does not specify so much detail that responsible professionals cannot respond to unforeseen and necessary changes. Policy efforts directed at technology integration in schools need to reflect on and address answers to the following policy questions:

- Why is technology being used (e.g., to improve learning, increase learning options, facilitate alternative assessment methods, etc)?
- What technologies and delivery systems are especially important (e.g., computers, distance education, portable instrumentation and tools, etc.)?
- What are the priorities for implementation (e.g., staff, targeted grades, content areas, populations, etc.)?
- What evaluation standards and benchmarks will indicate successful implementation (e.g., subjective data, normed data, national benchmarks, etc.)?
- Who is ultimately responsible for successful implementation (e.g., specific committees, administrative personnel, technology coordinator, technical support staff, etc.)?
- Who is responsible for interpreting evaluation data (e.g., specific committees and administrative personnel, curriculum coordinators, etc.)?
- What funds and time will be available to implement technology integration efforts (e.g., multiyear budget allocations, special grants programs, professional development allocations, etc.)?

The National School Board Association notes that effective board policy:

✓ *Reflects the educational goals of the school district.*

✓ *Is written within the scope of the school board's authority.*

✓ *Is adopted through proper board procedure.*

✓ *Is respectful of legal and constitutional rights and requirements.*

✓ *Is communicated to the people it will affect.*

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Case Scenario

Albert Einstein Elementary School lies in the heart of Chicago's Ida B. Wells Housing Development. Its students, 300 young African Americans in prekindergarten through eighth grade, come from a community recently identified as one of the 15 poorest in the nation. The school's students, parents, and community look to the school to provide one of the only avenues for equitable access to hardware, software, and technology skills-building experiences.

In the spring of 1997, after having received a number of technology grants from the Illinois State Board of Education, the school hosted a visit by Bill Gates, chairman of Microsoft Corporation. Mr. Gates wanted to see what use students and teachers made of computers in the classroom and how they used the Internet to research and explore topics. Reporters covering the visit noted that only the best and brightest students had been selected to meet with Mr. Gates. But they were wrong. The fact is that Einstein's students were evenly represented, including those with learning disabilities. The story the reporters missed was that school leaders at Einstein have a vision for the kinds of students they want to produce and the role they want technology to play in helping students get there.

That vision for the Einstein school community was developed by the school's Technology Advisory Committee. The committee's action took place following several parental awareness activities to promote wider community participation in the planning process. The committee gathered data from as many sources as possible. Collaborative planning activities included a town hall meeting, a Computer C@fe demonstration of technology for the greater community, teacher surveys, student questionnaires, and community-based focus groups. The result is the following technology vision statement:

> *The technology vision of the Albert Einstein School is to imbue students with the infrastructure in technology necessary to support their successful egress from school and access to the basic essentials for robust participation in the world of tomorrow.*

The Technology Advisory Committee associated five overarching goals with their vision. These goals are stated as follows:

1. To maintain an external school technological literacy program in order to promote and sustain the support of the school's community
2. To imbue students with the infrastructure of technology in order to develop their skills as information navigators, analysts, and communicators
3. To implement a Technological Literacy staff development program in order to develop, enhance, and promote the integration of technology throughout the curriculum
4. To build a technology infrastructure in order to create and support a student-learning environment reflective of the basic essentials necessary for technology literacy
5. To implement an instructional program that incorporates the *Six Essential Learnings in a Technological Society* as recommended by the Illinois State Board of Education

Einstein's technology plan is an evolving document. As these goals are achieved, the technology committee and school leaders anticipate having a supportive community that looks upon technology as a positive, valued resource. The students will be able to speak the language of the 21st century and access information and experiences from around the world, and the teachers will become facilitators of engaged learning practices.

Reflection Questions

- ✓ *How does technology enhance the learning experiences for all students with different learning styles, abilities, motivation, and interests?*
- ✓ *Why are engaged learning practices key to the successful use of technology in the classroom?*
- ✓ *How do the answers to the first two questions inform the development of a vision for integrating technology into schoolwide improvement plans in your specific school context?*

Internet Resources

An annotated list of Web sites that address the topic "Develop a Vision and Policy" starts on page 91 of this handbook. Use these Internet resources to become more informed about involving all relevant stakeholders in the process of developing a schoolwide and communitywide vision for the use of technology to support and enhance learning. Assign each committee member a Web site or two to investigate and hold a meeting to report the findings back to the team.

- What is the timeline for implementation and who has authority to change the timeline (e.g., specific committees, administrative personnel, classroom teachers, etc.)?

Technology planners should be aware that technology often acts as a catalyst to many changes within an organizational system. Some changes are foreseen and expected, while others are not. Policy changes also will be necessary as implementation efforts progress. Good policy keeps pace and supports equitable uses of technology based on the school community's vision.

Focusing Your Tasks

The primary job of the technology planning committee is to develop a technology plan that aligns with your school's existing or emerging school improvement vision, learning goals, and systemic operations. In some cases, your school improvement planning committee may decide to develop the technology plan itself or to appoint a subcommittee to do so. The advantage of this approach is that it avoids the unnecessary confusion that inevitably comes with the duplication of planning efforts. In other cases, people with specialized expertise in technology may be brought in to supplement the efforts of your school improvement planning committee.

Action Steps for Developing a Vision

One of the first tasks of those involved in generating the technology plan is to decide what kind of technology planning committee is necessary and who should be on it. As your committee works through the change process inherent in technology planning and implementation, committee members will benefit from doing the following:

- Read Chapter 2 in this handbook on analyzing technology needs and identifying goals. This chapter outlines a common knowledge base that, if shared, will help the technology planning committee work as a team.
- Hold a study group to engage relevant stakeholders in discussing the case scenario provided in this chapter.
- When your committee is ready, begin the collaborative community planning process and record your community's vision for integrating technology into schoolwide improvements on Tool #1 (see page 109).

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Analyze Technology Needs

Objective

To conduct a needs assessment of how technology should address important learning goals in your school and community.

Overview

Your technology planning committee will work more efficiently if members are knowledgeable about the important uses of technology in education. Two sources can provide them with such knowledge. One source is research. Having a common understanding of research findings and best practices provides a foundation on which to plan the use of technology in your school. The second source of information is your school community itself. All stakeholders have information to give the planning committee on how and where technology can increase or improve learning within the school and the community.

> ***Educators will need to take action on three fronts, which include defining what it means to be educated in a digital, knowledge-based society, transforming schools into high-performance learning organizations responsive to this new definition, and establishing new measures for assessing student progress.***
>
> Lemke and Coughlin, 1998, in *Technology in American Schools: Seven Dimensions for Gauging Progress.*

Perceptions of Technology and Culture

Today's children will live longer, travel more miles, use more information, and interact with more people of other cultures than any previous generation—all because of technology. Medical technology has increased the length and quality of life. Mass communications technologies have expanded the ways and means of obtaining, generating, and transferring knowledge around the globe. Robotics technologies have reduced manual labor and revolutionized manufacturing industries. There are even technologies that have the memory and processing capacities to challenge and extend the intellectual skills of the workforce.

Preassessment

1. Do your school community stakeholders understand how technology is shaping 21st-century cultural norms?
2. Do your school community stakeholders understand how technology can assist schoolwide improvement and academic achievement?
3. Do members of your technology planning committee know how to conduct a comprehensive needs assessment using a collaborative community process?

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A Few Facts About Change

There will be as much change in the next three decades as there was in the last three centuries.

By the time today's students graduate from high school, they will have been exposed to more information than their grandparents were exposed to in a lifetime.

Every two or three years, the knowledge base doubles in scientific and technical literature that impacts our daily lives.

Satellites orbiting the earth generate enough data to fill 19 million volumes in the Library of Congress—every two weeks.

National School Boards
Association, 1997

Perspectives in mainstream American culture speak both "pro and con" about uses of technology in schools. For young people who have grown up with telecommunications, computers, videodiscs, and MTV, technology is a given. They cannot imagine life without it. But for families and schools, this poses a critical issue: What are the appropriate educational uses of technology in the classroom and at home?

The popular press quotes educators and citizens who have seen schools use technology poorly and produce unimpressive learner outcomes. Some researchers, too, argue against putting too much technology into schools. Oppenheimer (1997), for example, warns schools of the folly of cutting fine arts and other curricular enrichment programs to purchase computer technology. He particularly takes aim at the use of expensive technology for educational activities that could be accomplished just as well without it. An examination of these and other issues will help your technology planning committee align your educational vision and goals with appropriate methods, tasks, and resources, including hardware and software. That way, your plan will reflect good educational practices and the goals of your community, as well as extend your schoolwide improvement efforts.

Research on the Relationship of Technology and Learning

Technology can provide teaching and learning opportunities that were previously unavailable. To understand the relationship between technology and education, several principles are in order. First and foremost is that the success or failure of technology depends more on human factors than it does on hardware or software. According to Sheingold (1991), it is now well understood that the challenge of integrating technology into schools and classrooms is much more human than it is technological. In *Using Technology to Support Education Reform* (1993), and in *Technology and Education Reform* (1997), Barbara Means and her colleagues note that research shows the instructional value of technology lies in the way that it is used and in the activity structure that surrounds it, rather than in the hardware or software itself. In *Plugging In: Choosing and Using Educational Technology* (1995), Jones and her colleagues found that technology's effectiveness is dependent on the learning environment in conjunction with the capabilities of the software and hardware to perform tasks one could not do otherwise.

Researchers agree that using technology to support outmoded educational systems is counterproductive. In a comprehensive review of research findings, Valdez and McNabb (1997) found that using computers in classroom activities collectively shows few significant effects if teaching practices do not change as well. In addition, they report the following:

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- The success or failure of technology-enabled learning experiences often depends on whether the software design and instructional methods surrounding its use are congruent. Some educational technology applications are highly adaptable while others have a single purpose. Each has been designed according to particular philosophies and theories of learning. Educators need to clearly define their purpose for using particular technology applications.

- The success or failure of technology applications in educational settings depends on an appropriate match between the technology application and the reform readiness of the setting in which it is being used. The degree of congruence between reform and technology significantly determines whether or not educational uses of technology will result in positive or negative impacts.

- The usefulness of technology depends on having a critical mass of computers. Research and best practices indicate that a minimum of one computer for every 4-5 students is necessary if students are to be able to use technology in a manner that will enable significant results within the classroom.

Given societal and economic considerations, technology needs to be integrated into the very fabric of curricular programs across America, regardless of economic and geographic location, to ensure equity in our public schools and to enrich the future of today's children.

Conducting a Technology Needs Assessment

Every school and community has important strengths it can draw upon to achieve its technology vision. Solid technology planning recognizes these strengths: experienced trainers and advocates, highly motivated school community members, existing hardware and software, and funding and partnering opportunities on which to build. Most schools and communities also have areas in which they would like to be stronger. The purpose of a technology needs assessment is to identify the gap between your school's technology vision and goals and its present situation. Closing this gap will then become the focus of your technology planning.

Rules of Thumb in Conducting Your Needs Assessment

✔Involve representatives from among all stakeholders in the collaborative needs assessment process.

✔Keep your vision of essential learning goals the primary focus for your needs assessment.

✔Document the information you already have that informs answers to primary questions.

✔Identify gaps in your information that indicate what additional information needs to be obtained during the needs-assessment process.

✔Choose data collection methods and instruments that are appropriate for those from whom you are gathering your information.

✔Make a timeline and devise a plan for gathering your information.

✔Be sensitive that priorities emerging from your needs assessment may require some people to shift uses of their time and resources.

✔Analyze and synthesize all of your information about the various levels of needs, then set priorities and determine the implications for action.

✔Report your findings, priorities, and implications for action to all stakeholders to establish consensus about decisions based on the comprehensive needs assessment.

✔Respect and consider core values of the group of learners that the results of your needs assessment will target.

Your school or district already may have conducted needs assessments as part of an ongoing program evaluation plan. This resource can yield useful information for your technology needs assessment. Finding out what information already exists is a preparatory step in the assessment process. The technology planning committee should identify existing information and analyze it with technology in mind. This might include taking stock of your present technology inventory, student achievement, special population needs, and school report card. Other data to inform your needs assessment may come from your school's improvement plan, Title I profile, or other reports that document the school community and its achievement. However, because the technology planning committee is charged with implementing a technology plan that will enhance (and alter) current teaching and learning practices, the planning committee may need to collect new information or look at existing information in new ways to develop a comprehensive understanding of technology needs related to learning goals. For example, you may want to survey teachers to learn more about their capability to use technology, or ask parents about their perceptions of technology in the classroom and for the home.

Many schools and districts rely on their family-school-community partnerships to help them develop strategic plans, school improvement plans, Title I school profiles, standards, and analyses of achievement scores.

It is just as important to draw on the local community in conducting a technology needs assessment.

One of the most important steps in thinking through your school's technology needs is matching the needs of learners for achieving high standards with the functions of particular technology applications. For technology to improve learning, it must offer the capacity to engage, connect, and inform all learners instrumentally and equitably. The gap between your desired learning goals for students and your students' performance, and the resources you have to bring to bear on their performance, becomes the field of study for the needs assessment and the work of your technology planning committee.

Following is a framework for understanding the purpose for, and processes involved in, conducting a comprehensive needs assessment. Based on Witkin and Altschuld's (1995) suggestions about needs analysis, technology planners should examine needs on three levels:

- The needs of all learners in meeting student learning standards and professional development standards
- The needs of those supporting learners, including parents, teachers, administrators, community members, and health and social service personnel
- The needs of the organization supplying technology resources to learners

Your needs assessment will provide a way for you to identify and evaluate the goals of target audiences, as well as strategies for achieving those goals. In this handbook, the needs assessment procedure focuses particularly on how technology can help address these goals. Figure 2 (see page 20) poses four guiding questions to help focus your comprehensive technology needs assessment. Answers to these questions may reveal, in some cases, that technology will not provide the most efficient or effective solution strategy. Likewise, an effective needs assessment will help you determine the benefits technology can provide to your school community, as well as its limitations. In all cases, for a technology infrastructure to effectively support family-school-community partnerships, technology planners must be inclusive, systemic, and practical.

◆

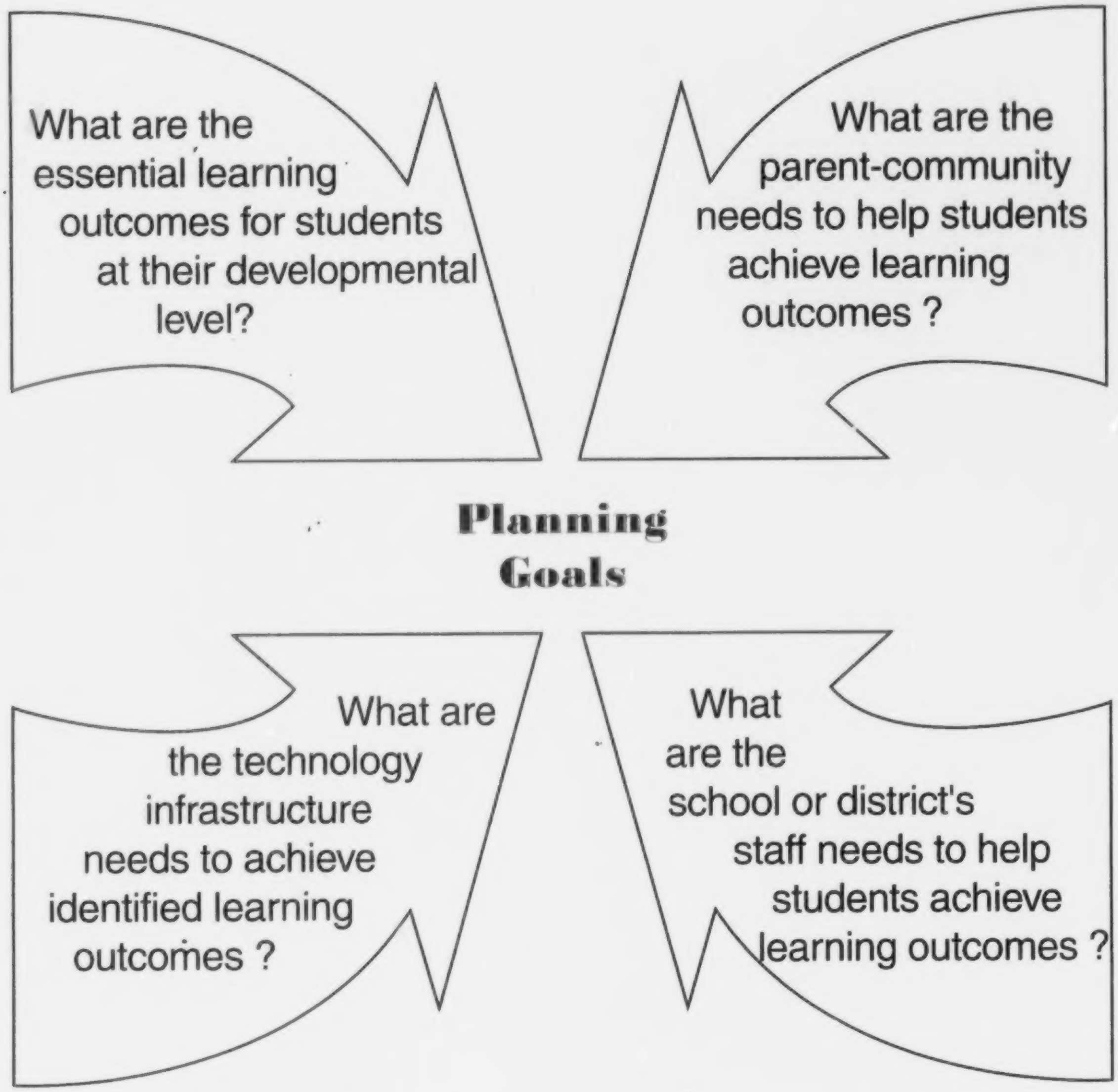
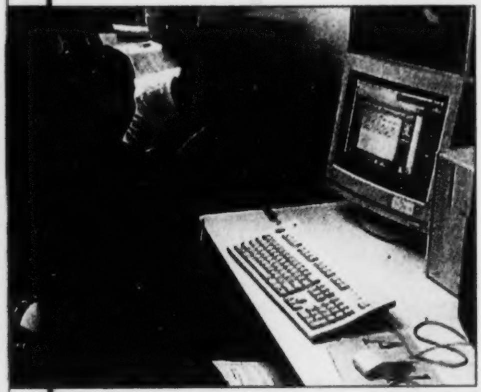

What are the essential learning outcomes for students at their developmental level?
What are the parent-community needs to help students achieve learning outcomes ?
Planning Goals
What are the technology infrastructure needs to achieve identified learning outcomes ?
What are the school or district's staff needs to help students achieve learning outcomes ?

Figure 2. Guiding questions to focus your comprehensive technology needs assessment.



Case Scenario

Albert Einstein Elementary School has a long history of involving its school community in collaborative decision making. To help involve staff and community members in schoolwide planning processes, the school implemented Project CANAL (Creating a New Approach to Learning). As part of this program, all segments of the school staff, as well as parents and community members, had extensive training in team- and consensus-building skills to prepare them for collaborative decision-making endeavors. Einstein also expanded the Project CANAL process to include its university partner, DePaul University's Center for Urban Education, which is an adult literacy provider to the community. Another partner is the Martin Luther King Public Library, which participates in Einstein's summer program and has designed a school year program in which teachers take students on walking trips to the library. Another way that the local community is involved in school decision making is through the Technology Planning Committee. This committee provides a forum where various stakeholders can participate in making decisions about technology planning, development, implementation, and evaluation.

Like all public schools in Chicago, each year Albert Einstein Elementary School develops and submits a School Improvement Plan for Advancing Academic Achievement to the Chicago Public School District's central office. As part of this plan, the school is required to submit two goals that will be the focus of the instructional program for the coming year. The district mandates Einstein's first goal to be improvement in reading. The second goal, which was selected by the school community, is to use technology as a tool in the improvement of instruction in all curricular areas.

In addition, Einstein is participating in a program funded by the district called the Curriculum Alignment Project. In this project, teachers receive assistance in planning classroom activities from a commercial vendor who has aligned the State Goals for Learning, the Chicago Academic Standards, and the Iowa Tests of Basic Skills with the Chicago Public Schools standardized assessment. The vendor initially helped Einstein administrators and teachers align their textbooks with the Chicago Curriculum Alignment Project instruments. Teachers then wrote a timeline indicating which skills would be taught at what instructional point. They are now in the process of identifying additional resources, including technology, that will be aligned with the Curriculum Alignment Project goals.

Reflection Questions

✓*Are the stakeholders in your school community well prepared to begin participating in a collaborative decision-making process for technology planning?*

✓*How will your technology planners use the technology vision and needs assessment data to align their technology plan with district mandates and accountability measures?*

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Internet Resources

An annotated list of Web sites that address the topic "Analyze Technology Needs" starts on page 92 of this handbook. Use these Internet resources to learn more about technology needs, planning, and implementation.

Action Steps for Analyzing Technology Needs

To make your needs assessment manageable, it may be helpful to conduct it in the following manner. This will help the technology planning committee draw a comprehensive picture of your school's needs in helping students meet essential learning goals. Your technology planning committee may want to parcel out the tasks to subcommittees whose job is to gather the necessary data. These tasks are as follows:

- *Conduct a K-12 student needs assessment* to identify the essential learning outcomes for your students at the appropriate development level(s) and uses of technology to address those priorities (see Chapter 3 for more details).
- *Conduct a parent-community needs assessment* to identify parent and community involvement priorities and uses of technology to address those priorities to help students achieve essential learning outcomes (see Chapter 4 for more details).

Once your technology planning committee has identified its priorities for K-12 student learning and parent-community involvement, it can shift its focus to assessing the staff skills and technology resource needs of the school organization. Identifying the organizational needs assessment calls for your committee to do the following:

- *Conduct a staff needs assessment* to identify your school or district's staff needs and uses of technology to address those priorities to help students achieve essential learning outcomes (see Chapter 5 for more details).
- *Conduct a technology resource needs assessment* to identify the technology resources your school or district needs to empower students, parents, and staff members to achieve essential learning outcomes (see Chapter 6 for more details).

Once the committee has conducted the needs assessment procedures and compiled its findings, a primary evaluator can systemically analyze and synthesize all of the information into a summary report.

- Use Tool #2, Comprehensive Needs Assessment Chart, provided in the Toolkit (see page 111), to help compile the comprehensive needs assessment findings. The information summarized on the chart should reflect common categories and themes that emerged across all four steps of the needs assessment process described above.

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Focus on Student-Centered Learning

Objective

To establish priorities for the uses of technology in meeting technology literacy and standards-based learning goals.

Overview

Technology often plays the role of catalyst within a district, ushering in educational reforms that call for student-centered practices. The American Psychological Association (1997) has established a set of learner-centered principles that focus on psychological factors *primarily internal to, and under the control of, the learner.* The learner-centered approach is based on the understanding that each learner is unique. When integrating technology into a learner-centered classroom, students' individualized learning styles and strategies become apparent.

Reviews of research conclude that low-achieving students, or those with little prior content knowledge, are likely to require more structure and instructional guidance than students at higher levels of achievement or with more content knowledge. Thus, a rule of thumb for selecting technology resources is that students with different levels of achievement and content knowledge require a range of technology resources. Students also require guidance on how to use electronic tools appropriately. Today's interactive digital technologies call for higher-order thinking skills, as well as technology literacy skills, to maximize uses of technology for authentic purposes.

> ***It is impossible for me to imagine how school leaders who are focused on more authentic ways of doing math and science, who are developing rich environments for learning, can achieve that without technology.***
>
> Linda Roberts, technology adviser to the U.S. Secretary of Education as cited by Trotter, *Education Week,* 1997

Preassessment

1. Does your technology plan address technology literacy skills and implement ways for learners to acquire them within the curriculum?
2. Are staff members and students prepared to use technology to meet literacy and content area standards?
3. Are there students within your school population who could benefit from additional uses of technology tools for remediation, acceleration, or special help in specific areas?

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21st-Century Job Performance "Know-How"

Reading and writing at fairly high levels of comprehension, analysis, and interpretation will become the norm. Workers will need to read well enough to understand and interpret diagrams, correspondence, manuals, charts, graphs, and specifications, and to write such products as well.

Mathematics and computational skills, essential to maintain records, estimate results, use spreadsheets, or apply statistical process controls to negotiate, identify trends, and/or suggest new courses of action, will become the standard in many jobs.

The high-tech nature of many industrial and professional fields will increasingly make technology literacy skills a basic requirement for employment.

Establishing priorities where technology can make curriculum and instruction more engaging, relevant, and successful requires school improvement planners to make a number of decisions. Topmost are two concerns, both of equal weight. One is deciding where and how technology in curriculum and instruction can be most effective. Studies reveal that the use of electronic, interactive technologies as learning tools can make a significant difference in, among other things, student achievement and learner motivation (Reinking & Bridwell-Bowles, 1996; Selfe & Hilligoss, 1994; Kulik & Kulik, 1991). The second decision, just as important, is how to respond best to society's demands for technology literacy.

What Are the Technology Literacy Needs for the 21st Century?

Priorities for curriculum and instruction need to reflect 21st century expectations for technology literacy skills in the workplace and society-at-large. Since the early 1990s, many have credited the informating capacity of technology with creating tough, new demands on American workers. The term "informating," coined by Zuboff (1988), refers to the capacity of information technologies used in such fields as banking, manufacturing, and medicine to produce deeper levels of data than had ever been possible before. In describing these advances, Zuboff writes: "One thing seems clear—the informating potential of the technology cannot be exploited without human skills in ways of thinking that are conceptual, inferential, procedural, and systemic" (p. 172).

The demand for workers who can think in ways that are conceptual, inferential, procedural, and systemic challenges schools to reexamine their educational objectives and instructional strategies. Technology has permeated banking, medicine, business, and manufacturing, where workflow processes depend highly on a rapid innovation cycle that makes today's tools obsolete long before today's students complete their schooling. This means that schools need to pay attention to flexible technology literacy and learning-to-learn skills.

Notes:

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Case Scenario

A Case where Seeing Was Believing

Emily, a teacher/coordinator of allied health at Crockett Career and Technical High School in Detroit, believes that although today's young people learn to use computers easily, they are sometimes handicapped by the resistance and fear of adults who lack technology literacy skills themselves. "It is incumbent upon parents and educators to become more computer literate, learning side-by-side, working as a team toward a common goal, to help all of our kids to be world-class learners," Emily explains.

Emily, an educator for 30 years, practices with the philosophy that teaching and learning is a personal interaction where the teacher helps students inquire, search, and learn how to learn. Her perspective made Emily believe that a computerized learning environment would hinder the human interaction that she as a teacher enjoys with her students. "At first, I perceived the computer to be *very* dehumanizing. In my Ohio upbringing, parents and teaches were a close-knit team. I believe it is important to see our young students through the eyes and heart of a facilitator and friend. As a teacher, I have a small-town, 'folksy' philosophy and delivery; that is, where teachers flow into the community, even in urban Detroit," Emily said.

She clearly remembers being intimidated the first time she used an ATM. Using the computerized card catalogue at the library produced the same kind of uncertainty. She also remembers the early 1980s professional development programs on mechanical and impersonal computers. To her, computers represented the "great unknown," and she liked it that way, until recently. During the school year, Emily participated in *Project Educator,* one of Chrysler Corporation's education outreach programs for teachers. During visits to a high-tech industrial plant, she became more aware of her role on a united team that included corporate personnel and educators working to instill in students an ethic of becoming proficient in a career; maintaining an appropriate appearance and attitude; being a team player; and being a critical thinker, problem solver, and effective user of technology.

At Chrysler she saw firsthand how the computer is the engine that drives the corporation. "I especially was impressed by the use of computer technology on the plant floor. Computers now run the production line that used to be manned. Now, the person on the line is responsible for computer programming, process monitoring, and interpreting computer-generated data. Those with both the computer know-how and the thinking skills access the computer. Their jobs are not physically laborious; they are skilled tradesmen, and they make the higher wages," Emily explains.

From her corporate experience, Emily now brings to the classroom her new perspective about the meaning of a technological culture and the importance of technological literacy. She also has new ideas about how to use technology in the allied health curricula. And she plans to advocate at her school for training to teach students and parents how to access low-cost community health education on the Internet, and Title I parents how to access social services, make inquiries, and receive valuable online communications to help them help their children learn. Emily now contends that technology skills are vital. Technology planning committees, she maintains, ought to spread the word about the social, economic, and educational benefits of technology throughout the school community.

Reflection Questions

✓*How did Emily's perceptions and attitude about technology evolve?*

✓*What are some anticipated consequences of Emily's corporate experience for her students?*

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How Can Technology Support a Standards-Based Curriculum?

Technology is a catalyst for change in academic content. The types of technology resources that give students access to curricular content are expanding. On both state and national levels, policymakers are infusing technology into content standards and goals. One example of this trend comes from the Wisconsin Educational Technology Plan PK-12 (WETP). WETP is based on the belief that "curriculum and technology will play an unquestionably crucial role in the futures of individual children and our world. Experts from many disciplines advise that technology should and can play an important role in curriculum planning, development, delivery, assessment, and administration" (Wisconsin Department of Public Instruction, 1995, p. 95). WETP outlines ways in which technology can facilitate developmentally appropriate learning experiences at the elementary, middle school, and high school levels.

- The literature on research[1] and best practice indicates that technology influences content areas in the following ways:
- Hypertext and hypermedia add depth and elaboration to content through associative, audio, dynamic visual, and video texts that effect the nature of reading and writing across the curriculum.
- The interactivity of computers makes it possible to adapt content to meet individual student needs.
- Telecommunications and the Internet provide access to emerging disciplinary and interdisciplinary databases, real-time phenomena, and social communities not accessible through print-based curricula.
- Computers and ancillary electronic devices facilitate the manipulation of data and the visualization processes invisible to the human eye or beyond human memory capacity, which assists with experimenting and understanding actual, futuristic, and hypothetical concepts, principles, relationships, and probabilities.

Overall, the literature addressing how technology can be used in various content areas indicates that teachers and students will need to know how to select and use electronic resources that provide (1) the core content for a given curricular area, (2) the interactive supports that adapt content to individuals' developmental and/or learning style needs, and (3) modifiable tools that allow teachers and students to adjust technology resources to meet individual learner needs and interests. The following sections provide an overview of how technology applies to specific curricular areas.

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[1] Bolter, 1992; Carrier & Jonassen, 1988; CTGV, 1997; Griest, 1992; Gumpert & Cathcart, 1985; Hativa & Becker, 1994; Landow, 1990; McKnight, Dillon, & Richardson, 1996; Park, 1996; Reinking & Bridwell-Bowles, 1996; Riel & Harasim, 1994; Romiszowski, 1997; Senge, 1990; Zuboff, 1988.

Technology in English Language Arts Instruction

The new English Language Arts Standards, developed by the National Council of Teachers of English and the International Reading Association, reflect the influence technology is having on the discipline. Standard 1 acknowledges the need for students to be able to "read a wide range of print and nonprint text" (1996, p. 25). Their definition of text now explicitly includes multisensory forms of communication as well as print.

In reading instruction, electronic books, often on CD-ROM, turn reading from a static, print-based activity into a multisensory, interactive experience. Most print-based books are unilinear and embody a story grammar or rhetorical structure that assumes the reader will start at the beginning and read through the page sequence to the end. Hypertext, however, has made reading multilinear (Bolter, 1992; Reinking & Bridwell-Bowles, 1997; Ulmer, 1992). The reader can choose from among a number of reading paths and decide which one to follow. Electronic storybooks tend to preserve linear story grammars while adding multisensory characteristics that link the meaning of printed words to audio support and animated pictures or video clips that convey layers of meaning not found in print.

Electronic books often allow readers to adapt texts to the level of their vocabulary skills or prior knowledge. The adaptive features of computer programs can individualize learning approaches and techniques according to the needs of individual learners (Park, 1996). Electronic books can be used to support students' accuracy, ease, and fluency of letter recognition and identification, for example. There is some evidence that young and/or struggling readers can read print supported by the audio and animation features of electronic books easier than they can read print books (McNabb, 1998).

Some students find writing skills particularly difficult to acquire because of the cumbersome process of having to revise their writing over and over again. Today's word-processing applications often allow students to draft and revise their work efficiently and proficiently so long as they have solid keyboarding, software, and analytical skills (Baker & Kinzer, 1998; Owston, Murphy, & Wideman, 1992). Word processing technology supports such writing tasks as brainstorming, analyzing audience, defining a purpose, organizing content, structuring an argument, and evaluating one's own or another's writing. A host of software supports these activities, including spelling and style checkers, embedded reviewer-comment functions, and writing and revision prompts. These electronic tools can assist writers in generating and manipulating text purposefully, when the writer also applies appropriate thinking skills to the task. However, with no guidance on how to use electronic writing tools, students will too readily follow only the

The following poem illustrates what can happen when students rely too heavily on spelling checkers and not enough on thinking skills:

I have a spelling checker; it came
with my PC.

It clearly marks four my revue
miss steaks I cannot sea.

I ran this poem threw it, I'm sure
your please to no.

Its let her perfect in it's weight,
my checker tolled me saw.

Arthur Unknown
(Holdstein, 1994, p.9)

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preprogrammed advice on the screen and/or apply paper and pencil methods to their electronic writing process.

To sum up, technology has many uses in English language arts instruction. These include:

- Drill and practice in reading and writing to improve basic skills
- Record keeping for self-monitoring
- Word processing to generate and organize text
- Software to support editing, including electronic grammar, spelling, and style checkers
- Authoring tools for creating multimedia presentations
- Multimedia reference tools, such as CD-ROM encyclopedias, to aid student research
- Instructional vocabulary, phonics, and story mapping games
- Software for teaching reading strategies, including electronic books with multisensory stories
- Collaborative writing spaces for online learning communities

In her presidential address synthesizing the recent research about language arts curricula at the National Reading Conference, Au (1997) stated that "ownership of literacy needs to be the overarching goal of the curriculum. Ownership may be defined as students' valuing literacy" (p. 5). Ownership of literacy has as much to do with how one reads as it does with why one reads. Taking ownership of literacy requires having the motivation to become literate, which is more and more imperative for successful living in the information rich culture of the 21st century. Today's electronic information technologies provide a rich resource for fostering students' ownership of literacy.

Technology in Mathematics Instruction

Mathematics teachers were early users and champions of technology because much of the initial software that was available to schools assisted in the teaching of basic mathematics skills. Since then, many schools have reported that students who supplemented regular instruction with computer-assisted instruction for drill-and-practice did better in mathematics than students who received conventional instruction. But perhaps even more significant is that because the new technology made calculations and graphing easier, it changed the very nature of the problems that mathematics can solve, as well as the methods

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mathematicians use to solve them. Generally speaking, in mathematics education technology serves as a tool for:

- Acquiring, evaluating, and processing numeric information.
- Performing calculations.
- Graphing and communicating numeric information.
- Investigating and solving problems with mathematical premises.
- Creating and running models and simulations.
- Scaffolding higher levels of abstraction.

The National Council of Teachers of Mathematics (NCTM) was the first professional organization to create national standards for the appropriate uses of technology in a content area. NCTM's recommendations suggest that:

- Appropriate calculators be available to all students at all times.
- A computer be available in every classroom for demonstration purposes.
- Every student have access to a computer for individual and group work.
- Students learn to use the computer as a tool for processing information and performing calculations to investigate and solve problems.

The NCTM report *Curriculum and Evaluation Standards for School Mathematics* (1989) stated that exposure to appropriate experiences gives students *mathematical power*. Mathematical power is defined as "an individual's abilities to explore, conjecture, and reason logically, as well as the ability to use a variety of mathematical methods effectively to solve non-routine problems. This... is based on the recognition of mathematics as more than a collection of concepts and skills to be mastered; it includes methods of investigating and reasoning, means of communication, and notions of context. In addition, for each individual, mathematical power involves the development of personal self-confidence." The hands-on learning experiences fostered through today's interactive technology applications empower students with a level of mathematical power they cannot achieve without technology.

Technology in Science Instruction

Science is very conducive to the use of hands-on technology. In real life, scientists are heavy users of technology and are highly dependent on it to conduct their work. Yet, surprisingly, the National Assessment of Educational Progress Survey (using data collected in 1994 but reported in 1996) showed that except for social studies (8%), science teachers were the lowest users of technology among the major content areas. The report indicated that only 12 percent of college-bound students reported using computers in their science courses. This is in sharp contrast to 72 percent using computers in schools for word processing, 44 percent for English classes, and 27 percent in mathematics class (National Center for Education Statistics, 1997).

In 1996, a coalition of organizations under the auspices of the National Research Council released science education standards for the nation. They included technology standards such as being able to use technology to study scientific processes, explore new scientific knowledge, and understand the impact of technology on living organisms, among other uses.

Network Science Models represent a promising use of technology to meet the science standards. Through telecommunications, usually the Internet, students at several schools work collaboratively to collect data. They then organize and analyze the data and share their findings with others (Feldman & Nyland, 1994). For example, one testbed project called for students' exploration and data collection of wetlands, providing hands-on learning experiences with the scientific research methods. Students disseminated data given by other schools through satellite broadcasts. They explained the results of their own inquiry and compared them with the results of other schools working on the same unit. "Much of the research of the student teams depended on the information that was downloaded and discussed during interactive broadcasts" (Feldman & Nyland, 1994, p. 3).

Some of the concerns about using technology in science revolve around costly safeguards for high-end technology equipment, including specialized computers, probes, temperature, motion, color and other sensing devices, data analysis, and display tools. Additionally, many excellent applications of technology in science require ready access to the Internet, which is not yet available in many classrooms. However, most schools have an Internet connection available in the learning resource center and/or computer laboratory. While weary of outdated drill-and-practice technology in their science classes, many educators are not aware of the educational software built for scientific inquiry and discovery. The following list represents technology commonly used to support science instruction:

- Simulation and demonstration tools to show how concepts apply to real-world phenomena
- Exploration and guided practice tools to assist students' use of scientific knowledge
- Online data-sharing communities involved in scientific inquiry

- Reference CD-ROMs and Web sites for information research
- Problem-solving tools that foster scientific thinking
- Creative activity tools that encourage students to imagine probabilities
- A range of digital and electronic instrumentation

Technology in Social Studies

Technology is also valuable in social studies. For example, WETP advocates using geographical, mapping, and history-based software applications as well as age-appropriate simulations with elementary students who are expanding their understanding of the world beyond themselves and their families. "Simulations offer students the opportunity to participate in historical events or major decision-making events by virtue of role playing. Whether studying about the 50 states or debating the 'pros and cons' of declaring America's independence from England, students will find a wealth of excellent technology-based applications to make exploring social studies themes exciting" (Wisconsin Department of Public Instruction, 1995, p. 97). Suggested technology applications in social studies include:

- Databases and graphing and charting software for conducting comparative studies of demographic trends
- Electronic atlases and laser disc, video, or CD-ROM images for developing an understanding of geographical and physical characteristics
- Telecommunications, especially the Internet, for conceptualizing self, family, and community contexts around the world and for demonstrating characteristics of our global village
- Simulations for role-playing activities of historical events
- Statistical programs for conducting quantitative research and analyzing results

Educators involved in all content areas have dabbled in using computers within their curricular areas since the appearance of personal computers in the late 1970s. Today, the momentum behind connecting classrooms to a technology infrastructure is requiring educators to do more than dabble. Existing technology applications support all areas of curricula, including world languages, business, vocational education, fine arts, and special education. While some academic fields are more advanced in their integration of technology into curricular activities than others, technology planners should consider all aspects of their curricular programs to identify places where technology can benefit students by enhancing their learning experiences. •

Case Scenario

Where Student Learning Is the Goal and Technology Is the Means

District 189 in southwestern Illinois comprises the cities of East St. Louis, Alorton, and Washington Park. The district enrolls nearly 12,000 students in 21 elementary, 3 junior high, 2 senior high, and 1 alternative high schools. Most of the students are African American; 83 percent come from families that receive public aid, live in institutions for neglected or delinquent children, are supported in foster homes with public funds, or are eligible to receive free or reduced-price lunches. One-parent families, headed by females, are typical. The unemployment rate in the district is very high.

The district's leadership understands the role technology plays in the workplace and in everyday life, and they are determined to prepare the students to use it. The district's technology plan states that "access should be equitable, not just for the privileged but for the poor as well."

Recently, the district has been on the state's academic watch list, which puts increased pressure on the school community to improve students' standardized test scores. The school improvement team from each of the district's schools analyzed students' achievement gaps and established priorities for what needed to be done to improve students' performance. Meeting content area standards became the district's first goal, and technology became their means for achieving that goal. The second priority in the district is to close the equity gap that exists in learning areas and grade levels.

District leaders are particularly concerned about their students' low scores on the state's reading assessment. They attribute much of the problem to many young children entering school with little, if any, preliteracy preparation. This makes it difficult for these students to keep up with the district's curriculum expectations. It also places a great deal of pressure on both teachers and students to catch up before the problem perpetuates itself in the later grades. Since reading is a cornerstone for all learning, the lack of reading skills in first grade often affects students' self-efficacy as learners well into their school careers.

The district's curriculum coordinators attended professional development seminars to learn about structuring uses of technology to enhance reading instruction at all grades. Then, they applied for a grant that would fund the purchase and implementation of the *Waterford Early Reading Program,* which would enable staff to track student progress for three years starting in kindergarten. The program integrates individualized print awareness, word play, writing, reading, and phonemic awareness instruction within a multimedia format that helps children associate their prior knowledge with printed letters, words, and story grammars. It also helps young readers produce up to 100 different storybooks using rebus and close techniques with interactive options for the learner to chose among characters, plots, and themes. Students can then take their books home to share with other family members during family read-aloud story times. These storybooks facilitate school-to-home early literacy partnerships in homes that previously had no books.

The early reading program, set up on dedicated networked computers in the kindergarten classrooms, has a management feature that provides all students with equitable hands-on time. Equitable time is based on each student's progress toward the learning goals. Each student has a scheduled daily session, with a minimum of 15 minutes up to 25 minutes, based on the teacher's assessment of the student's progress. The teacher can modify the types of activities and time for activities each of the students has access to when logged onto the computer. Teachers received professional development training about integrating the reading program into their overall curriculum plan and classroom activities.

Behind the scenes, the program generates and stores a progress report about each student and groups of students so that teachers can adjust the pace and content of their classroom lessons according to their students' individual and group learning needs on a daily or weekly basis. Integrating the student progress data and reading lessons from the computer program into classroom instruction motivates students to read while helping teachers keep instruction at a level that is challenging, but not so difficult that students become discouraged, according to Toni Perrin, the technology coordinator involved in the project.

For students whose reading ability is at the elementary and junior high levels, the district implemented a reading support tool called *Accelerated Reader. Accelerated Reader* is an information learning system that, with its companion assessment software, tracks students' reading levels and progress. STAR (Standardized Testing and Reporting), the adaptive placement testing program, has been correlated with the Iowa Basic Skills Test. Students take the adaptive computerized test and, within five to seven minutes, the system identifies their reading level and zone of proximal development. When integrated with the Learning Resource Center's online card catalog, the system allows students to identify, read, and be tested on a variety of popular and classic children's books at their own reading level. Students become motivated to read as they build confidence in their reading ability and experience the benefits of reading for pleasure as well as for academic knowledge. In the upper grades, the district has implemented multimedia writing enrichment labs where students can use their reading and writing skills to conduct Internet research, correspond through e-mail with authors and other professionals, and generate word-processed reports and multimedia presentations.

Reflection Questions

✔*How did the school district identify its priorities for uses of technology within the curriculum?*

✔*What features of the technology help teachers individualize instruction for students?*

✔*Once they decided to focus their initial technology implementation on the reading curriculum, what steps did technology planners take to provide continuity across the district?*

The K-12 Student Needs Assessment for Technology Planning

The primary task at hand is to determine your students' learning strengths and weaknesses, drawing on what is already known about your student population and drawing on additional information you may need to gather. Existing information from your school or district's Title I school profile, standardized and state test scores, assignment grades, teacher progress reports, and student portfolios can provide a baseline about your student population.

Keep in mind what research says about student learning and essential goals, as well. Research shows that a number of personal, social, and health factors impinge on students' academic performance. Common areas of academic weakness among Title I recipients are reading, math, and science (Olson & Jerald, 1998). In addition, when students use technology as a learning tool, they need technology literacy skills. In answering the guiding question about essential learning outcomes, it is important to take into account your learning environment, student characteristics, and the nature of the learning tasks.

Compile a summary report of the needs assessment data to develop consensus among stakeholders by providing background information to inform their decisions about the implications of the needs assessment data. Let them know that targeting students' areas of academic weakness is feasible with individualized instructional technology and interactive technology resources. Using technology to support and augment the development of students' higher-order thinking skills, technology literacy, and school-to-work opportunities are ways to facilitate their continued success as lifelong learners. Instrumental uses of technology to achieve these goals include technology applications that:

- Support basic technology literacy skills' development.
- Facilitate basic knowledge acquisition and rule application through guided practice exercises.
- Demonstrate relational phenomena found in real-world contexts through simulations.
- Support learning projects by providing access to multimedia resources and a variety of production tools.
- Facilitate partnership building aimed at compacts for learning among students, organizational staff, family, and business-community members through online learning communities.
- Extend time on task, individualize learner pacing, and increase hands-on interactions that boost learner self-efficacy and motivation.

Action Steps for Focusing on Student Learning

- Hold a study group or engage stakeholders in discussing the case scenarios provided in this chapter.
- Assign a subcommittee to compile student achievement data and complete Tool #3, the Student Needs Assessment Worksheet, found in the Toolkit (see page 113).
- Establish a software adoption committee for each grade level and/or content area. Using a software review form can help focus the committee's evaluation and selection, as well as provide a software profile for teachers to access when planning to use technology resources in their classroom activities. See the *Educational Software Preview Guide* compiled by the Educational Software Preview Guide Consortium as an excellent resource for this endeavor. (available from the International Society for Technology in Education at (800) 336-5191 or http://www.iste.org)
- Teachers planning to integrate technology into student-centered learning activities can use the Technology Integration Planning Chart (Tool #4, see page 115) to pull all the pieces of the puzzle together. A sample activity plan is also provided for discussion purposes. For more information on compiling your own planning chart, refer to the Teacher's Guide that accompanies this handbook.
- For fun, have students of all ages do the Basic Technology Terms Crossword Puzzle (Tool #5, see page 117). Then hold a hands-on demonstration of each term. Students can also use the Internet or CD-ROM encyclopedias to research a technology topic associated with their own interests and design an original crossword puzzle to challenge their classmates and build vocabulary.

Notes:

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Internet Resources

An annotated list of Web sites that address the topic "Focus on Student-Centered Learning" starts on page 93 of this handbook. Use these Internet resources to learn more about hands-on activities that integrate technology into curricular areas and content domains.

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Involve Parents and the Community

Objective

Increase parental and community awareness of and participation in the positive role technology can play in their children's learning.

Overview

Research findings underline the importance of family participation in the development and learning motivation of their children. Numerous studies indicate that high-performing students in high-poverty settings usually have mothers who integrate learning into daily activities, share books, and have high academic expectations. In today's fast-paced, changing culture, it is absolutely vital to involve family and community members in raising and influencing children's motivation to learn. High achievement can be fostered early on through use of language and academic socialization; that is, how parents influence the attitudes in their children that are essential for learning.

How Do Families and Communities Influence Children's Use of Technology?

Parents are a child's first teachers, and the home is the first classroom. No one disputes the importance of parental support and community collaboration in a child's growth and development. Research shows that optimal self-efficacy, a positive attitude, and motivation to use technology for a range of learning experiences foster overall high achievement. Self-efficacy, in particular, is at the core of learning. It develops from success at performing tasks, one's perspective of success in performing tasks in relation to how others performed the same tasks, and supportive interactions about one's abilities with significant adults (Bandura, 1992).

Glennan and Melmed (1996) found strong research evidence to suggest that "the availability of technology in schools serving poor, minority, and special needs populations did not appear to lag substantially behind the averages of schools taken as a whole. However, to the extent that technology enables learning outside the school, large disparities in the access for students of different classes and ethnicity to technology is a matter of concern" (p. 96). The concern is that, although federal, state, and local funding and policies have somewhat mitigated

> ***Since putting computers in the school, I've seen such improvement in [my son] Albert's academic work and reading comprehension. The technology has really opened up a lot of learning doors for him. I see him wanting to go to school early and leave late and that's—WOW!***
>
> Juanita Buono, 1998, *Technology Planning: Putting the Pieces Together*

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The percentage of 3- to 17-year-old Americans with home access to computers is 12 percent Hispanic, 13 percent African-American and 36 percent white according to the 1992 U.S. Bureau of Census.

Preassessment

1. Does your school regularly invite parents and other community stakeholders to be involved in school activities using technology?
2. Does your school inform parents and community members about the importance of technology within the larger scope of daily life?
3. Do your parents have access to the resources necessary to actively support their children's learning with technology at home or at a community resource center?
4. Does your school or district provide ongoing technology training to interested parents?

technology-access inequities for those in poverty settings, differences in home possession and computer use are substantial. Family use of technology appears to differ when income, parental education, and ethnicity differ (Anderson, et al., 1995). These familial differences can have considerable consequences for student achievement at school. Access to technology that supports extended time on learning tasks outside the normal school day enriches learning and provides additional learning resources. In this regard, Glennan and Melmed (1996) point out that technology may become "one more element in an array of factors that cause a student's educational attainment to be highly correlated with the socioeconomic status of his or her family" (p. 97).

Family members may differ in their knowledge about technology and in their interest and willingness to become involved in the technology planning initiative. Some parents do not yet understand the impact technology will have on their child's education or future employment prospects. In fact, adults may be apprehensive of technology use in schools. It is important to involve family members in the development of a school's technology plan, establish partnerships, and include them in discussions, decisions, and technology-related training. If parents are not involved, they may well choose to oppose the plan and pass on negative attitudes about technology to their children. Parent-involvement strategies include the following:

- Provide a parent-friendly school climate that encourages parents and family members to collaborate on technology initiatives.

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The East St. Louis School District reserves two seats for parents in all of its professional development technology programs and seminars.

- Develop open and ongoing communications with parents about technology planning.
- Provide opportunities for parents to collaborate and help solve problems related to technology use, including developing plans for their own technology skill development.
- Tap parents' technology knowledge and expertise by inviting knowledgeable parents to be advisors and resource providers on your implementation team.
- Design the technology plan to benefit and reach all families in the school community.
- Promote a philosophy of partnership with parents.
- Request and support parental volunteers in your school's family technology resource center, in computer learning labs, and in the classroom.

(Adapted from Henderson, Marburger, and Ooms, 1986)

Technology innovations are advancing at unprecedented speed. At the same time, educational systems are undergoing reform. On the surface, more new instructional methods, such as learning by design and problem-based learning, which incorporate technology, may look like collaborative play and not the serious competitive homework assignments many parents remember. Parents need to be aware of and support this combination of educational change. Some parents may find new technologies causing uncomfortable levels of "technostress" by increasing the generation gap between themselves and their children. Technology planners can help avert technostress by keeping parents informed and knowledgeable about various ways to use technology for learning at school and in the home.

As technology moves into your school, communicate with parents as often as possible and in as many ways as possible. For example, write a newsletter (publish it in print and electronically) that regularly informs parents about technology developments, such as purchases, locations, and capabilities of new technology. Invite parents to the school so they can see, learn, and experiment with the technology. Provide technology training after school or in the evenings and invite parents to attend.

Make learning with technology fun for the whole family. Parents want to see their children succeed. Help parents foster their children's interests by hosting a Family Technology Night designed around interactive technologies for learning and technology-related career opportunities. Or, design an Internet Treasure Hunt around topics of interest, such as vacation travel, hobbies, and careers to provide hands-on experiences with the fastest growing source of information available to learners of all ages.

Keep parents informed about the Technology Literacy Challenge that envisions a 21st century where all students are technologically literate. The initiative requires the fulfillment of four main goals:

1. All teachers in the nation will have the training and support necessary to help students learn to use computers and the information superhighway.
2. All teachers and students will have modern multimedia computers in their classrooms.
3. Every classroom will be connected to the information superhighway.
4. Effective software and online learning resources will be an integral part of every school's curriculum.

(U.S. Department of Education, 1996)

According to *Family of Learners* (NCREL, in press), a positive communication program must be a cooperative effort among administrators, staff, and teachers. Some parents have a history of receiving "bad news" from their children's teachers and other school personnel. These experiences can hinder the collaborative planning process. Your school's staff may need to make an extra effort to establish productive and meaningful communication with these parents. The telephone provides one viable technology for most teachers and families to develop the desired lines of communications. If parents in your school or district do not have regular access to a telephone tree, set up a face-to-face message tree among neighborhood volunteers. One important goal is to have all parents agree to a "Compact for Learning with Technology."

The ultimate goal is to help students graduate from high school with the foundation skills that will enable them to participate in a technology-rich society and become lifelong learners. "Indeed, many of the major changes in social and economic life are ushered in by innovations in technology" (Bandura, 1992, p. 4). In poverty settings, technology training programs and technology resource centers for parents can be a key to fostering learning achievement. Technology provides motivation to learn, individualizes learning time and practice, and enhances career skills that can yield high market value. Just take a look at technology-related Help Wanted ads in newspapers across the country!

What is a Compact for Learning with Technology?

A compact is (1) a commitment to share responsibility for student learning and (2) an action plan for a family-school-community partnership to help children receive a high-quality education (U.S. Department

- If teachers make at least one positive family phone call per week, at the end of a single school year, each teacher would have made contact with three dozen families and be familiar with their attitudes and concerns regarding uses of technology for learning at school and in the home.
- If both teachers and parents have e-mail accounts, communications can be sent confidentially and received at both parties' convenience. Provide teacher and administrator e-mail addresses to all parents and set-up a program to help parents obtain e-mail accounts upon request. Privacy of conversations and mutual interaction is important.
- To help measure success, maintain a log of telephone calls or e-mails to parents, recording the substance of the conversation about the school or district's technology initiatives.
- If the budget permits, and a staff member is willing to be available, advertise one evening a week when parents and students can use the Technology Lab or Learning Resource Center to share hands-on experiences using technology for learning.

of Education, Compact for Learning, 1997). Despite 30 years of research that shows families are important educators of their children, many parents, for various reasons, had become less engaged with their children's daily school activities. Schools are currently making an extra effort to re-engage parents in their learning community. Educators know that family involvement in education does make a difference in a student's achievement at school and in life. Many schools now sponsor family involvement initiatives and activities to improve student learning and participate in family-school-community partnerships.

Title I of the *Improving America's Schools Act of 1994* supports local efforts to help children meet challenging standards and to get families involved. Every school receiving Title I funds must develop a compact that clarifies what families and schools each will do to help children reach high standards. The compact serves as a clear reminder of each party's responsibility to ensure that children learn what is required of them (U.S. Department of Education, *Compact for Learning*, 1997). To learn more about school-family compacts, read *A Compact for Learning*. This document describes research and best practices in creating partnerships between schools and parents and includes partnership parameters, tips for implementing partnerships, and sample agreement forms (available from the U.S. Department of Education and online at http://www.ed.gov/pubs/Compact/).

Case Scenario

A Community Gears Up for Technology Literacy

Deborah, a teacher at Crockett Career and Technical High School in Detroit and an involved community member, learned firsthand the importance of technology as a tool for learning and communication when she returned to college.

On the first day of class, the professor asked for everyone's e-mail address, informing her students that e-mail would be her only way of communicating with them outside of the classroom. "Therefore, if we did not have home or job access to a computer and e-mail account, then we would have to make a daily trip to the college computer lab to pick up our messages," Deborah explains. In addition to a word-processed research paper and the e-mail requirements, the students were also to conduct two research projects using the online library catalogues and the Internet. All projects required oral presentations and had to be accompanied by electronic PowerPoint slides.

At the same time, Deborah heard about the school district's Wired for Learning Program in partnership with the City of Detroit Housing Department and the IBM Corporation. Wired for Learning goals include:

- Dial-in access to the school district's computer network. Parents that have computers at home (or access to computers at work or elsewhere) will be able to access the online system remotely.
- Access to school-based technology centers located in neighborhood schools. In addition, schools will have a lending pool of laptops that can be checked out, like library books are checked out, and used with the dial-in computer network connection.
- Access to technology at selected recreational centers and churches in collaboration with the City of Detroit and community human service agencies. This goal will ensure that all students and parents have equitable access to technology.

Technology, technology—it's everywhere, Deborah realized. Insights from these experiences led her to help the pastor of her church explore ways the church could help infuse technology into the community. The pastor was aware of the impact technology makes on American culture—at home, in schools, and in the workplace. Deborah was not surprised when he proposed starting a computer class for church members. "It is his vision to see every one of his church members computer literate. He wanted to give every member the opportunity to learn about computers, everything from doing simple word processing to building and repairing computers," Deborah said.

The church's board of directors, of which Deborah is a member, helped the pastor design and implement a community technology initiative using the 30 computers that the church had recently acquired through a corporate partnership. A survey of church members found that over 90 percent were computer illiterate. If they did use a computer at work, they only knew how to perform specific job-related tasks. The first thing on the board's agenda was to design and implement a computer training program.

In the summer of 1998, the church hosted its first Vacation Computer Bible Camp. For children attending camp, studies and activities centered on using computer software, the Internet, and e-mail to research Bible lessons and relate them to community and global concerns. The software programs they used were truly interactive. The computer presented the knowledge, and the camp teachers acted as facilitators. Once the children completed their search for information, they used computer word processing to produce a report.

Having mastered various uses of computers for learning, children were encouraged to continue on to camp activities centered on computer programming and repair. They were also encouraged to become facilitators of activities they themselves had completed.

The church also sponsored two-week computer training sessions for adults. Adults were encouraged to move through the levels of skill development similar to the children's program to become facilitators, programmers, and computer-repair persons. Once members become computer literate, the program will be opened to the community-at-large. The members will serve the community by facilitating the camp sessions.

To make their vision feasible, the church partnered with a local computer company that trained members in basic technology literacy until members had the skills to become facilitators themselves. "It is our goal that once the children and parents have learned the value of the computer, they will find it a must to have one in their home. The business partnership will provide church members with computers at a reduced price," Deborah explains.

Now the church is developing a Web page. Any member wanting to obtain information or to inform members of births, deaths, weddings, or other events can post messages in the site's discussion area. If a member needs transportation, they can e-mail the church's van driver regarding their needs. As an educator, Deborah anticipates that the church program will benefit children and parents in many ways as they learn and work in a technological society.

Reflection Questions

- ✓ *What motivated Deborah to explore ways to infuse technology into her community?*
- ✓ *How will the school district benefit from the community-based technology initiatives described?*

The Parent-Community Needs Assessment for Technology Planning

The primary task at hand is to determine your parent and community involvement strengths and weaknesses, drawing on what is already known about your community population and drawing on additional information you may need to gather. Existing information from your school or district's Title I school profile, demographic data, and parent-teacher organization can provide a baseline about your parent-community population. Additional information may be collected through surveys and/or focus groups.

Keep in mind that research says parent-community involvement in student learning can have a highly positive impact through a variety of activities (Olson & Jerald, 1998, p. 18). In addition, parents and community members who have access to the right resources can help children overcome the social and economic isolation that plagues many impoverished urban and rural areas (Olson & Jerald, 1998, p. 12). Parental support for children's learning can occur through positive and ongoing parent-teacher communications, volunteer time at school, modeling use of technology resources and lifelong learning, career mentoring, and involvement in field trips to the community's informal education museums. In addition, programs that represent a strong commitment to business partnerships and school-to-work initiatives require strong community relations.

Compile a summary report of the needs assessment data to develop consensus among stakeholders. This report will provide background information that will inform their decisions about the implications of the needs assessment data. Targeting areas of high personal interest to parents and other community members can help stimulate their involvement in children's learning. Instrumental uses of technology to achieve these goals depend on strategies that include the following:

- Make portable laptops available through the Family Resource Center for use at home.
- Negotiate with business partners to offer low-cost computer purchases for interested families within the school community.
- Provide information on obtaining e-mail, Internet, and/or Web TV accounts to help the school expand children's social context for learning and access to electronic information and online learning communities.
- Publicize parental technology training opportunities.
- Encourage use of telecommunications to enhance parent-teacher interactions.

Action Steps for Involving Parents and the Community

- Create a study group to engage subcommittee members and other relevant stakeholders in discussing the case scenario provided in this chapter.
- Sponsor a Family Technology Event to increase parents' awareness and hands-on experience with the types of technology the school plans to purchase. Arrange for community volunteers to use the Parent Technology Survey form (Tool #6, see page 119) or conduct short parental interviews during the event to collect parental needs assessment information.
- Use Tool #7, the Parent-Community Needs Assessment Worksheets (see page 121), to compile and synthesize the findings from your parent-community needs assessment data.
- Conduct a parent involvement program that culminates in signing Tool #8, the "Partners in Learning With Technology" student-parent-teacher-administrator agreement form (see page 123).

Notes:

Internet Resources

An annotated list of Web sites that address the topic "Involve Parents and the Community" starts on page 96 of this handbook. Use these Internet resources to learn more about the impact of parental involvement and community collaboration programs and methods to support student learning with technology.

Support Professional Development

Objective

To provide school staff with technology-rich learning opportunities to enhance professional practices.

Overview

Using technology to engage students in learning introduces a new dynamic into the relationship between teachers and students. Instruction becomes more individualized. Students take responsibility for managing their own learning and learn through exploration. Teachers help students become producers of knowledge and encourage them to share their knowledge and skills with others. In the best uses of technology, the teacher's role changes from delivering traditional chalk-talk-textbook instruction to coaching, monitoring, and verifying student achievement of learning goals.

But many teachers are still casual or nonusers of technology. For technology to make the new dynamic between teachers and students a reality, the teaching profession must reskill its workforce. For that reason, supporting technology-rich professional development opportunities for teachers and other school personnel is a critical component of a school-wide technology plan. Four types of technology-related proficiencies deserve particular attention: (1) basic uses of technology (technology literacy); (2) selecting and integrating technology into instruction; (3) using technology for classroom management and administrative purposes; and (4) advancing one's own professional learning.

> ***Teachers have found that learning to use a certain technology, originally as a way of communicating with others regarding a topic of interest, acts as a catalyst to open the door to more extensive computer knowledge and use.***
>
> Susan Loucks-Horsley, et al., 1998,
> *Designing Professional Development for Teachers of Science and Mathematics*

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Preassessment

1. Are teachers acquiring technology literacy skill to keep up with those of students?
2. Does professional development enhance teachers' technology proficiency levels? Are the methods for selecting technology resources congruent among your staff?
3. Does your school or district provide staff with personal e-mail accounts, easy access to an Internet connection, and subscriptions to online professional development services?
4. Do your curriculum coordinator(s), professional development coordinator(s), and technology coordinator(s) share responsibility for integrating school improvement and technology initiatives?

How Does Technology Change Teaching?

Research on implementing technology in schools indicates that before most teachers become fully comfortable in the new roles technology creates for them, they move through a several-stage change process (Bork, 1993). The first stage typically concentrates on the acquisition of hardware or "the drive to acquire computers, to move as many computers as possible into schools" (p. 72). Changes in pedagogy and institutional structures usually appear in more advanced stages of the process. "The only way interactive information technologies can be used effectively in education, just as the only way the book could be used effectively, is to develop entirely new courses . . . these courses could differ greatly in form, content, and teacher role," states Bork (1993, p. 89). Given this change process, support for professional development regarding technology uses should occur on many levels. Teachers' ease in operating hardware and software needs to be addressed before moving on to curriculum integration, classroom administration, and more advanced professional growth.

The Kenai Peninsula Borough School District has a well-structured professional development program built into its districtwide technology planning and implementation process (available online at http://www.kpbsd.k12.ak.us). Built on the Concerns Based Adoption Model, the program's modular structure provides an ongoing process that easily adapts to staff needs. The district has identified the following professional development strategies for supporting teachers' technology skill acquisition:

- The basic professional development program includes open technology lab time for experimentation with hands-on projects, informal peer mentoring, face-to-face show-and-tell discussions with a technology trainer, and a technology skill-of-the-month club.
- The intermediate professional development program includes release time to observe exemplary technology practices, team teaching with technology, computer-mediated show-and-tell activities among peers, tangible rewards, and recognition of technology-enriched professional practices.
- The advanced professional development program sponsors on-site technology conferences, release time to attend technology-related conferences, increased collaboration with students using technology for learning, action research, and professional reflection about technology-supported practices.

Empowering Teachers for Technology Literacy

Teachers need the same technology literacy skills that schools and society require of students. Among their responsibilities are modeling the use of new technologies for students, troubleshooting problems, and assessing technical support needs. To do so, of course, teachers first must be comfortable with the technology tools.

The International Society for Technology in Education (ISTE) has defined a set of technology literacy standards for all teachers (http://www.iste.org). Preservice teachers are increasingly required to meet these standards for teacher certification through the National Council for the Accreditation of Teacher Education (NCATE). Inservice teachers need the same kinds of professional development opportunities so they, too, can meet these standards and become innovative users of technology for learning. ISTE's standards are organized around levels of technology literacy skills that are necessary for various career paths. Two of the standards at the Foundation Level consist of the following technology literacy competencies:

- Basic Computer/Technology Operations and Concepts—for example, knowing how to operate a multimedia computer, implement basic troubleshooting, and use imaging devices.
- Personal and Professional Use of Technology—using productivity tools for word processing, database management, and spreadsheet applications; and using computers to support problem solving, data collection, information management, communications, presentations, and decision making.

Teachers need the know how to use a range of equipment. For example, LCD panels and computer projection units are becoming increasingly popular for whole-class demonstrations. Many schools have acquired multimedia demonstration workstations "on wheels" that can be moved from one classroom to another. Modeling the use of these technologies is a key component in implementing technology into classroom practice. Teachers' purposes for using the technology, however, is the driving force behind needing the hands-on technology literacy skills.

Integrating Technology into the Curriculum

Integrating technology into the curriculum requires hard work and purposeful planning on the part of classroom teachers and curriculum coordinators. The Milken Exchange on Education Technology (http://www.milkenexchange.org/overview/overview.html) convened a national working group to identify how technology enhances successful instruction. Success in three areas, in particular, depends on teachers being able to integrate technology into their daily practices. These areas focus on the learner, the learning environment, and professional competency.

The Learner. Technology provides hands-on, minds-on experiences that increase students' fluency with given content, strengthens basic skills, helps students acquire higher-level proficiencies, increases the relevancy of instruction to students' lives, motivates students, and provides interactive feedback about their performance.

The Learning Environment. Technology can change the learning context from teacher-directed to learner-centered activities, giving students more control of content, creating a more collaborative school culture, and providing different ways of accessing information and communicating with people. There are 14 learner-centered principles that compose the framework developed by the Presidential Task Force on Psychology in Education (http://www.apa.org/ed/lcp.html). The principles focus on a holistic set of psychological factors that refer to the cognitive and metacognitive, motivational and affective, developmental and social, and individual differences influencing learners and their learning performance. Many interactive software programs lend themselves well to learner-centered instructional approaches, such as learning by design and problem-based learning.

Professional Competency. Technology requires a new emphasis on using core technology literacy skills fluently, adapting and creating new curricula calling for engaged learning roles and tasks, instituting student-centered learning practices, using authentic assessment methods, developing a climate of professional practice and collegiality, and managing classroom instruction.

Selecting Appropriate Software

Teachers who are knowledgeable about the range of available software applications have invaluable tools with which to engage students in authentic learning tasks. Chapter 3 discusses types of software for use in various content areas. But, the array of software titles currently marketed to educators is overwhelming. Teachers who serve on software selection committees often shoulder the responsibility of evaluating and purchasing software for a curricular team or for the whole school. Some district technology coordinators oversee the selection process by providing selection committees with demo versions or review copies of software. It is best if teachers collaborate to develop a set of software evaluation guidelines for all to adhere to and provide continuity across the curriculum.

Teachers need to have enough hands-on experience with the software to determine whether or not the software:

✓Aligns with specific curricular goals and standards.

✓Adjusts to individual learning characteristics.

✓Contains developmentally appropriate content.

✓Provides teacher management options.

✓Generates student performance records.

✓Identifies prerequisite technology literacy skills needed by the learner to use the software.

A number of organizations are providing software evaluation guidelines and/or reviews for teachers as well. One of the best software evaluation Web sites is the SchoolNet Software Review Project (SSRP) available at http://www.enc.org/rf/ssrp/. The SSRP staff and a team of teachers post their evaluations of science, mathematics, language arts, and social studies software programs for elementary students. The reviews are categorized into a searchable database according to national and State of Ohio standards. Teachers can find software listed by title, appropriate age group, and content areas, then read the evaluations and reviews written from teachers' perspectives about using the software with their students.

In addition, the Internet brings hundreds of additional resources into the classroom. The Global Schoolhouse serves as an illustration.

Funded in part by the National Science Foundation to demonstrate the Internet's potential in classrooms, the Global Schoolhouse provides a registry of online activities for educators to join and/or research (http://www.gsh.org/). Most telecollaborative events fall into three broad categories: independent demonstrations, classroom exchanges, or group activities.

Accessing, Using, and Designing Administrative Functions of Technology

Technology enables teachers to individualize learning experiences for their students, generate multidimensional student performance records, create parental reports, and facilitate students' self-assessments and self-regulatory learning abilities. Documents that students generate online can be stored in multimedia formats and shared with appropriate stakeholders at designated times throughout the learning process. Likewise, technology tools can help teachers set up a range of diagnostic tasks that automatically track and report student progress. Collaborative group software assists with designing collaborative study groups around similar interests and/or developmental levels.

Resource people knowledgeable about the various technology applications accessible to teachers are an invaluable asset to any school involved in technology implementation. These individuals are more familiar with the functions of specific technology applications than are teachers and can provide useful information, for example, about aligning curricular goals with technology applications. They can work with teachers to explore and evaluate software, plan lessons around software, and set up systems to capture student progress toward essential learning goals.

Connecting to Information and Professional Development Opportunities

Integrating technology into teaching practices creates new roles for teachers. Technology offers just-in-time access to a vast storehouse of information and online learning communities for teachers' own professional growth and development. Teachers who have access to multimedia resources, interactive tools, and online learning communities can stay abreast of the latest research information, changing pedagogical practices, and professional events. They can share lesson plans and seek each other's advice on a wide range of classroom topics and problems. One of technology's primary benefits is that it all but wipes away great physical distances and/or time constraints by allowing teachers, either individually or in groups, to interact with other educators and experts in virtual learning communities when it is convenient for them.

No matter what the purpose of professional development—gaining technology literacy, integrating technology into instruction, using it for administrative purposes, or furthering professional learning—most successful professional development programs use a variety of strategies to advance their technology goals. Hands-on training, long-term study groups, online courses, peer coaching, and modeling each has its place in strategically meeting teachers' particular learning needs. The one strategy that usually is not effective is sending teachers to one-shot or off-site inservice workshops. Too often, these workshops focus their training on software and/or systems that teachers do not have readily available at their school for practice or use within the classroom. Another factor to keep in mind is that professional development plans for technology must be flexible to accommodate individual learner needs, innovations in technology functions, and changes in technology access.

Establishing Technology Proficiency Levels

Teacher teams need to reach agreement on what technology proficiency criteria are most pertinent to their grade level or content area. The following category descriptions define levels of technology use within the four proficiency areas for teachers' professional development. Table 1 provides an example of one district's technology proficiency chart that acts as the framework for a technology mentorship program. The mentorship program is supported at the administrative level with release time to teachers serving as technology mentors to their colleagues.

Basic Uses of Technology. Teachers acquire basic "know-how" skills for operating computer hardware, software, and ancillary equipment, such as scientific probes or telecommunications cameras, as well as troubleshooting abilities to address technical problems that may arise. The novice characteristically uses preset, surface toolbar features of technology to automate established practices. The intermediate user explores layered toolbar features of technology to increase productivity and efficiency. The advanced user customizes toolbar features to transform his or her daily workflow.

Instructional Uses of Technology. Teachers increasingly individualize their instructional practices with technology to support a variety of learner strategies to meet achievement standards. The novice begins to understand from a specialist how technology applications align with learning standards. The intermediate user consults with a mentor to successfully integrate technology in learner-centered ways that lead to overall standards achievement. The advanced teacher plays an active facilitation role within a community of learners, using technology on an individualized basis to meet achievement standards.

What Goes on in the Digital Schoolhouse?

✓ Independent demonstrations *encourage students to research a social, cultural, or curricular topic and inform others of their research through interactive multi-media presentations via the World Wide Web. These projects stimulate students' thinking, enhance their writing and research skills, and allow them to demonstrate what they have learned for authentic audiences.*

✓ Classroom exchanges *involve entire classrooms or large groups collaborating and exchanging information via telecommunications and computers. These exchanges can take place within the same school or across schools. Sometimes students get involved in online projects where they help other students by cross-age or peer mentoring.*

✓ Group activities *stimulate team thinking and problem solving to increase students' understanding of a topic. These projects encourage learner collaboration, provide a diverse and rich exchange of multimedia ideas, and encourage hands-on learning through interactive technology.*

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Administrative Uses of Technology. Teachers develop data-driven practices and manage individualized learning with the support of technology tools. The novice responds to mandated uses of technology for record keeping and scheduling. The intermediate user regularly enforces technology usage policies and draws on established management features of technology for monitoring and reporting students' progress as well as managing daily practice. The advanced user personalizes and/or creates technology tools for managing data-driven practices, helps develop usage policies, and models ethical technology practices.

Professional Development Uses of Technology. Teachers use telecommunications and networked computers to access online courses and information resources as well as collaborate among colleagues. The novice begins to use technology as a supplemental resource for accessing professional information. The intermediate user accesses technology for up-to-date professional information and to communicate one-on-one with colleagues. The advanced user relies on a paperless, interactive information system for professional growth and purposeful collaborations among students, colleagues, mentors, parents, and business partners.

The Organizational Staff Needs Assessment for Technology Planning

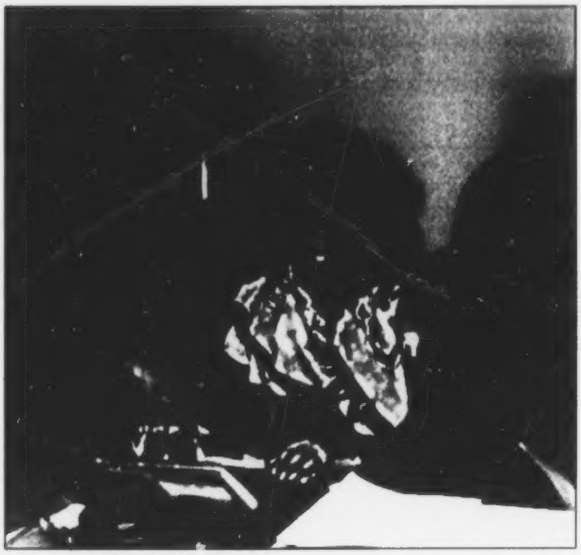
The primary task at hand is to determine your school or district staff's strengths and weaknesses, drawing on what is already known about staff and drawing on additional information you will need to gather. Existing information from your school or district's Title I school profile, administrative records, teacher portfolios, and staff surveys can provide a baseline about your staff.

A needs assessment upon which to base professional development decisions is particularly warranted at this time of great change within educational institutions as technology planning and implementation gets underway. "The professional developer and school staff should gather formal and informal feedback on all professional development activity through a variety of mechanisms (e.g., surveys, observations, and interviews). Data should be analyzed to determine what, if any, changes are needed in the programs. Similarly, the performance of professional developers can be monitored on an ongoing basis, with opportunities to discuss strengths and weaknesses and areas that can be improved" (Loucks-Horsely, et al. 1998, p. 155). The professional developers, who are providing services to staff, need to be highly literate in the appropriate uses of technology resources to support and enhance staff development and student learning.

Table 1: Sample Technology Proficiency and Levels of Use Chart

Proficiency Criteria	Novice Level	Intermediate Level	Advanced Level
Basic uses of word processing	• Teacher creates, saves, retrieves, and prints file(s) to store information electronically. • Teacher uses preset toolbars and templates for organizing word-processed plans and reports.	• Teacher manipulates electronic information using editing, formatting, and text analysis tools to generate plans and reports. • Teacher customizes toolbar selections for efficiency and organizes work folder(s).	• Teacher designs macros to merge information from other applications into word-processed reports and plans. • Teacher helps colleagues create document template(s) according to contextual needs.
Instructional uses of software	• Teacher relies on a specialist to align instructional software with learning standards for existing activity plan(s). • Teacher acts as an instructional aide to a specialist who implements activity plan(s) with students.	• Teacher is assisted in aligning instructional software with learning standards for interactive classroom activities. • Teacher implements learner-centered technology activities with the help of a colleague acting as an instructional aide.	• Teacher uses software to enrich and individualize content, with students defining areas of interest that meet learning standards. • Teacher assists colleagues in evaluating, selecting, and using software to foster specific learning outcomes.
Administrative uses of a wide area computer network	• Teacher enters mandated student data into districtwide database on a daily basis. • Teacher occasionally uses the schoolwide electronic reading program to track students' reading progress.	• Teacher uses electronic reading program records and a grade database to monitor students' reading progress. • Teacher implements students' self-assessment procedures with an electronic grade-level portfolio rubric.	• Teacher creates a database to integrate districtwide records, personal records, and student portfolios into biweekly assessment reports and parental updates on demand. • Teacher's biweekly assessment reports inform instructional plans.
Professional development uses of the Internet	• Teacher uses a computer network to access announcements about and sign up for district-sponsored technology workshops.	• Teacher uses the Internet to look up information and register for courses at a nearby university. • Teacher uses e-mail to communicate occasionally with colleagues and parents.	• Teacher uses the Internet to engage in online courses and lead professional discussion forums. • Teacher contributes resource links and artifacts of practice to school's teacher listserv.

Table 1: Example illustrates technology proficiency criteria and levels of use for teachers at a school district implementing its first technology plan for school improvement.



Case Scenario

A Team Approach to Technology for School Improvement

The Chicago Systemic Initiative (CSI), part of the Urban Systemic Initiative funded by the National Science Foundation, has implemented an ongoing professional development program focused on math and science curriculum within a school improvement framework.

At the heart of the CSI is a design team that provides leadership and support to the principal in a school. The design teams consist of five or more members from a school community. Most teams include a technology coordinator, math teacher, science teacher, resource teacher, and special needs teacher. In addition, these teams are not considered complete until at least one parent has joined the team as an equal decision-making partner. CSI began piloting its framework with schools selected by the district superintendent, but now, in its fourth year, schools can choose to become a part of CSI.

Each school's design team has to reflect the organization of the school and include support staff, such as counselors and librarians. The design team provides leadership for school improvement and development of a strategic action plan for math and science and the infusion of technology into the curriculum. "CSI's role … is to keep the process moving. We meet with the school's design team on a monthly basis to provide resource information and professional development. Team members then go back to the school and let us know what the school needs," explains Dr. Marie Jerigan, technology coordinator for CSI. The intent is to bring all of the components of a school system together to identify and participate in a systemic professional development program.

During the summer of 1998, CSI, in partnership with the Midwest Consortium for Mathematics and Science Education, conducted a 30-hour Summer Institute. The Institute focused on the integration of math, science, and technology within a school improvement framework. Participants were required to use their own school improvement plans. The Institute was the first half of a 60-hour professional development program that addressed pressing issues, such as systemic change, equity, team building, data-driven decision making, best practice models, and standards-based teaching and learning in mathematics, science, and technology. In the remaining 30 hours provided during the 1998-99 school year, the CSI design teams investigated, in depth, the issue(s) of most concern to them. Then they designed and implemented school improvement strategies and programs in their own school setting to address the critical issue(s).

"The message CSI sends to teachers is that technology is a tool that you use just as you would any other tool to enhance the learning situation," explains Dr. Jerigan. The goal is to be sure that schools have a curriculum that is worth working with—one that will prepare children to move on in the educational cycle for lifelong learning. One of the first things CSI did was to begin researching standards-based instruction and good programs that use technology. They then looked at how the teams could bring the two together. No one wants technology to be isolated. Technology should enhance the curriculum. CSI strives to empower teachers to know when they don't know, to be able to find resources for learning about what they don't know, and then use their new knowledge and resources to make informed decisions about their teaching practices and systemic organization.

Once a school's design team is involved, CSI teaches strategies to help the team analyze where they are and where they want to be. Once their school improvement goals are set, they then identify resources, including technology, that they will need to reach their goals. The library is one of the biggest resources in the school and the librarian is usually active in school improvement planning. The counselor is another great resource. For example, one of the biggest curricular concerns CSI has been addressing is preparing students for algebra by the end of eighth grade. If the counselor is not there to help bridge the gap for the student going on to high school, a lot of goals can be lost. "So, when you're working on school improvement, you really need someone from every division as part of the school improvement process. And if you don't have everybody in the loop for school improvement, then it is not going to work in the schools. The counselor and the librarian are just examples of the kinds of people who should be on the team," Dr. Jerigan explains.

Reflection Questions

- ✓ *What is the rationale for taking a systemic approach to professional development and technology integration?*
- ✓ *Why have teachers been reluctant to jump on the technology bandwagon?*

Keep in mind that research says staff in impoverished Title 1 schools often are under-qualified for the job, have a higher-than-average rate of absenteeism, and typically move on to other jobs more often than staff in other settings (Olson & Jerald, 1998, p. 16). Such dynamics heighten the need for ongoing professional development aimed at keeping staff up to date on technology literacy and curriculum integration methods to maximize the use of the school's technology infrastructure and related resources. Matching uses of technology with appropriate curriculum content, determining and facilitating technology skills' development for students, and providing instruction that integrates technology are critical implementation tasks facing all school staff.

Compile a needs assessment data summary report to develop consensus among stakeholders. This will provide background information that will inform their decisions about the implications of the needs-assessment data. Organizational target areas often include the following:

- Provide new and substitute teachers with easy, online access to information about your students, curriculum, and organizational context.
- Have a user-friendly technology guide to assist new staff and substitute teachers using available technology resources.
- Design the technology delivery system to enhance relationships with parents, family, and community partners through ongoing positive telecommunications, online training workshops, a family technology resource center, and compacts for learning.

Action Steps for Supporting Professional Development

- Form a study group to engage subcommittee members and other relevant stakeholders in a discussion on the case scenario provided in this chapter.
- Conduct a thorough staff needs assessment and compile findings using Tool #9 (see page 125) in the Toolkit.
- Purchase online subscriptions and ongoing professional training services that address the technology needs identified in your staff needs assessment.
- Use Tool #10 (see page 127), the Technology Proficiency Chart, with teacher teams to create their own technology proficiency levels of use relevant in their school context. Teachers then can use the chart to self-assess their progress as well as mentor others in area(s) where they have excelled personally.
- Distribute the *Technology Connections for School Improvement: Teacher's Guide* to interested staff members for their professional development. The *Teacher's Guide*, a companion booklet to this handbook, is designed for personal use by classroom teachers new to planning their own technology-integrated learning activities.
- Arrange for a "Helpline" to provide staff with just-in-time technical support within the classroom, learning resource center, technology lab, administrative offices, and wherever else they use technology for professional purposes.

Notes:

Internet Resources

An annotated list of Web sites that address the topic "Support Professional Development" starts on page 100 of this handbook. Use these Internet resources to learn more about emerging technology standards for teachers and innovative practices fostering professional development.

Build a Technology Infrastructure

Objective

To adequately supply learners of all ages with vital technology resources.

Overview

In high-poverty communities, schools may be the only place where students and adults have access to computers. According to the U.S. Census, in 1992, only 11 percent of households with incomes of $10,000 to $14,999 had a computer, compared with 56 percent for households with incomes of $50,000 to $74,999 (U.S. Bureau of Census, 1992).

Over the past five years, however, the number of homes with computers has risen sharply. Nonetheless, there is still a significant technology gap between poor students and their advantaged peers. These inequities remain not only in the number of available computers, but also in the quality of these computers.

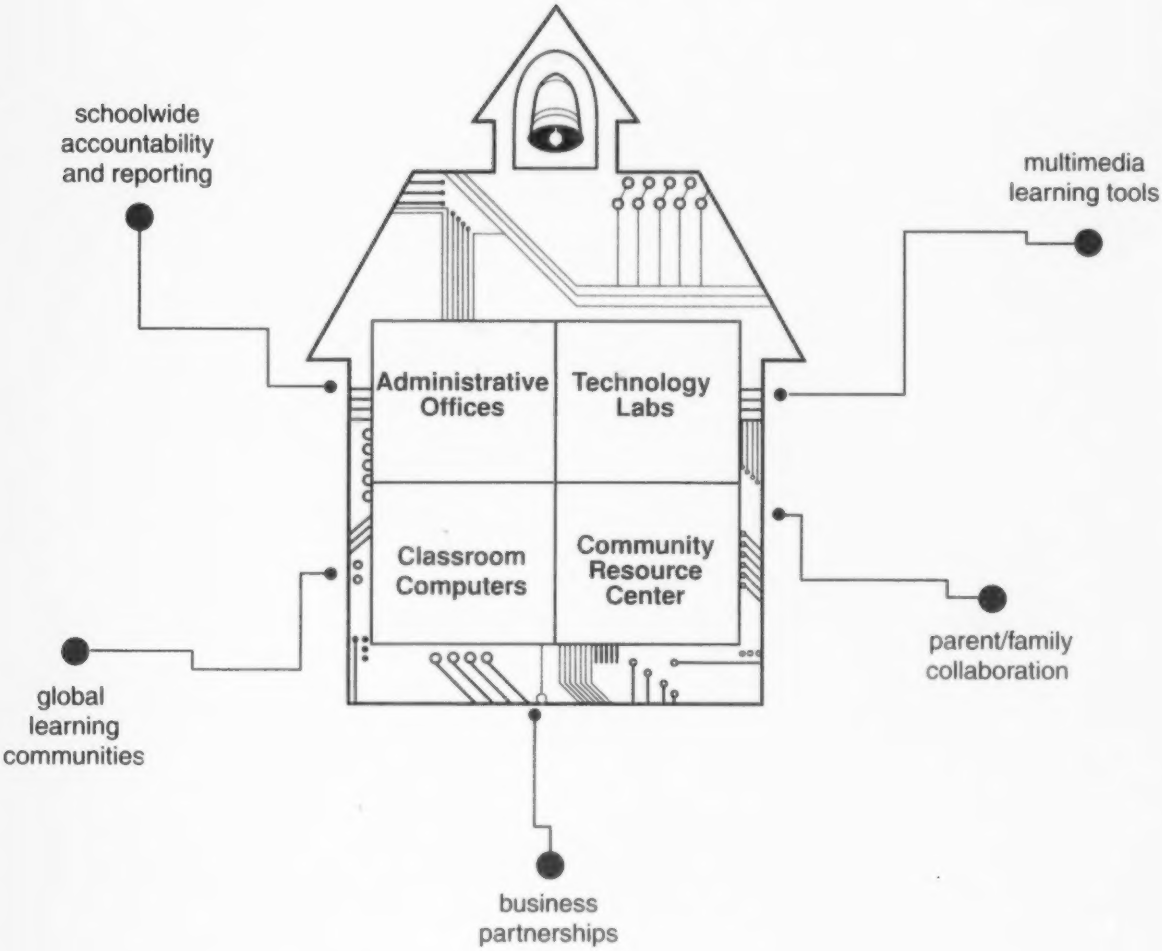
There is no shortage of technologies with which to build your school's or district's technology infrastructure. The marketplace teems with computers, CD-ROMs, audio and videodiscs, VCRs, and satellite dishes, to name just a few. The technology infrastructure in most school districts consists of a mix of these and other components. What is in the mix depends on the district's goals, objectives, and resources for integrating technology into its learning and administrative functions. Many schools are implementing technology plans to extend the walls of their school to others in local and distant communities for a variety of purposes (see Figure 3).

> ***If the way we think of change is limited by imagining things very much like the ones we know (even if "better"), or by confining ourselves to doing what we know how to implement, then we deprive ourselves of participation in the evaluation of the future. . . . As long as schools confine the technology to simply improving what they are doing rather than really changing the educational system, nothing very significant will happen.***
>
> Seymour Papert,1998, in *Technology in Schools: To Support the System or Render it Obsolete.*

Preassessment

1. Are your administrative offices, resource centers, and classrooms connected to the larger community network?
2. Are your technology resources up to date and distributed on an equitable basis?
3. Do teachers and administrative personnel have adequate access to technical support?
4. Does your school have appropriate policies and security measures governing uses of your technology?

Components of a Technology Infrastructure


schoolwide accountability and reporting
multimedia learning tools
Administrative Offices
Technology Labs
Classroom Computers
Community Resource Center
global learning communities
parent/family collaboration
business partnerships

Copyright © 1998. North Central Regional Educational Laboratory, Oak Brook, IL

Figure 3: Common purposes for connecting schools to the community through a technology infrastructure.

The following information about developing a technology infrastructure has been culled from educators who have already gone though the process of selecting technology for classrooms, schools, and school districts. The purpose in sharing it is to stimulate your own thinking about the components of technology that are essential to fulfilling learning goals in your school or district.

Your technology infrastructure can be as simple or complex as you make it. The driving forces are your end users' needs. As discussed in Chapter 2, in a school setting the technology *end users* may range from preschool-age children to senior citizens, including students, staff, parents, and community members. The types of software that run on your network may range from multimedia books to interactive programming tools to confidential data-management systems. It takes several years of dedicated effort to plan, design, and build a highly integrated instructional and administrative infrastructure that supplies the right type of information or software to the appropriate user(s) on a just-in-time basis. When planning a technology infrastructure, consider the range of functional, technical, and security requirements needed to keep it running smoothly.

Technology for Classrooms

In selecting technology for classrooms, the first consideration should always be how best to engage your students in the learning goals you want them to achieve. The following technologies have a place in most classroom learning activities, say educators who have already built successful technology infrastructures. Nonetheless, what is adequate in one classroom may be inadequate in another. Technology needs will vary depending upon the focus of the curriculum, the number of students that the technology is expected to serve, and the resources that are available.

Educators suggest the following array of technology be available in individual classrooms:

- One computer for every four or five students and one multimedia computer dedicated for teacher use
- A computer with an online network connection into the school that the teacher can use at home to prepare lessons and materials
- Software for curriculum applications and for record keeping
- Projection equipment, so the teacher and/or students can present materials to the full class
- A videotape player and TV set

Technology Infrastructure Requirements[1]

✓Functional requirements *are the tasks and/or procedures the technology is intended to perform, which differs according to the instructional or administrative purpose.*

✓Technical requirements *are the technical parameters of your equipment, such as hardware specifications, bandwidth, network connectivity, and software integration.*

✓Security requirements *include devices and procedures that protect against threats to the equipment, functions, and contents of your technology infrastructure.*

---

[1] Adapted from *Technology @ Your Fingertips.*

To order *Technology @ Your Fingertips,* write to the
Government Printing Office
P.O. Box 371954
Pittsburgh, PA 15250-7954
or call (202) 512-1800.

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- Supports for portable peripherals like laser disc players, such as extra electrical sockets
- At least one printer

The above list represents an optimal amount of technology in the classroom. As financial resources become available, your planning committee can add features to the technology that classrooms already have or recommend that new items be acquired.

Technology for Schools

Some aspects of building a schoolwide technology infrastructure are on a systemic level. For example, a computer network can connect students and teachers in classrooms throughout the building. It also may be available in general access rooms, such as the school library or computer lab. Some schoolwide technology supports a school's administrative functions.

Each school has its own technology needs and networking capabilities. An issue in many schools, and particularly those in high poverty communities, is the school's ability to physically accommodate the connectivity requirements of today's technology. Simply put, many school buildings are outmoded for today's learning needs. Even if they have plenty of computers or televisions, they may not have the building infrastructure—enough telephone lines or electrical sockets, for example—to maximize their use. Electrical capacity, Internet cables, and security measures all pose critical issues for technology planning committees to grapple with in this technological age. Another issue is space. Many schools have found it necessary to reconfigure their use of space to make it more flexible for new ways of learning and teaching, to accommodate future technology expansion, and to be able to easily move equipment from one part of the building to another. All of these matters need to be carefully thought through with an eye to the future.

The following are some components of a schoolwide technology infrastructure for your planning committee to consider:

- A schoolwide network with multimedia access in each room and growth capacity as the school adds equipment and bandwidth over time
- Need for computer labs for whole class functions and classroom computers for rotated use
- A server for storing Web pages, e-mail, and other electronic information used in the building
- Administrative functions, along with the hardware and software to support these functions

- A CD-ROM tower connected to the network
- Video production equipment so that teachers and students can create their own multimedia exhibits
- A video server
- Multiple Internet connections

Other schoolwide peripherals, especially high-cost ones, might be accessible to students and teachers on carts that can be moved from room to room as needed. Most schools find it helpful to employ their own technical support staff to handle *helpdesk requests* on demand and a technology coordinator to address curricular matters, if feasible. Otherwise, individual schools rely on their district office to provide technology experts to perform these services.

Technology for School Districts

The technology infrastructure in a school district has broad impact across all or most of the buildings in that district. The importance of some items, like a telephone system, is obvious. Here are other items for your technology planning committee to explore:

- A districtwide area network
- Servers for the district to use for administrative and instructional purposes
- Dial-up access for students, parents, and staff working at home

Technology also imposes new staffing requirements on school districts that include the following:

- A project manager to oversee the technology implementation process
- Technical staff for installation and maintenance of technology
- Support staff to analyze network usage and to design and plan for growth
- Professional development assistance for all staff, including teachers, librarians, administrators, and others
- Security personnel
- External consultants to provide everything from planning, to general advice, to infrastructure designs, to installation, to ongoing support
- Staff to plan and execute community outreach and collaborations

School districts have many responsibilities when building a technology infrastructure, including devising acceptable use policies and security procedures. While most schools report positive experiences with technology, it is still important for districts to have rules specifying the consequences of misuses. Deciding how your district would respond to technology infractions, such as altered or deleted files, disabled or missing workstations, misconfigured networks, and misuses of the Internet, is an important task for a technology implementation team.

New security issues face school district personnel when building a technology infrastructure. There are two types of security issues: physical security and electronic security. Physical security measures include upgrading the lock system throughout the school building, installing electronic monitoring devices on floors where technology is stored, and electronically tagging all equipment for easy identification if stolen. Electronic security measures include designing a hierarchical access structure for the network, installing monitoring software to search and report viruses and vandals, and installing backup and recovery tools such as a tape drive that can record and retrieve all networked files and applications. A useful Web site for advanced users, developed by the Department of Energy is available at http://www.ciac.org/news/. Also see Internet Resources for security and purchasing information.

Another school district responsibility is the purchasing of technology equipment. While it is critically important that teachers and building administrators have a say in the kind of technology that gets installed in their classrooms and buildings, there are often dollar advantages to districts negotiating with vendors and buying equipment in bulk. Hardware continuity also streamlines repair and upgrade needs later. Nonetheless, the software needs of the learners and staff who use the technology determine the hardware and netware requirements and specifications for the infrastructure.

Advancements in technologies' capabilities increasingly make technology infrastructure requirements more complicated. As the characteristics of technology infrastructures become increasingly complex, policies to govern the use of technology resources are increasingly pertinent. More specifically, integrating a technology infrastructure into the institutional fabric of a district involves establishing *technology resource usage policies*. A leader on this aspect of technology planning is the National School Network (NSN), organized in 1992 by the Educational Technologies Group at BBN Corporation with funding from the National Science Foundation. "The NSN is a broad partnership of educators coming together to address the challenge of Vice President Gore 'to connect all of our classrooms, all of our libraries, and all of our hospitals and clinics [to the National Information Infrastructure (NII)] by the year 2000'" (NSN, 1998, http://nsn.bbn.com/). The NSN's mission is to work on universal participation by schools and their surrounding communities in the restructuring of education in the United States through networked technology infrastructures. Schools involved in building a technology infrastructure have much to benefit from partnering with community members and organizations that have expertise in all aspects of network engineering. Networked technology is quickly becoming a required standard of practice.

To address these and other technology-related issues that may arise during your technology planning and implementation process, enlist as many knowledgeable parents and community members as possible. Doing so not only will provide a valuable source of advertising for the technology plan, but also will spread the responsibility for this monumental endeavor among a larger number of stakeholders.

Putting It All Together with a Technology Resource Needs Assessment

The primary task at hand is to determine your organization's technology resource strengths and weaknesses, drawing on what is already known about your school's or district's existing hardware, software, and connectivity capabilities, conditions of your building facilities, and technology knowledge of your various user groups (e.g., teachers, administrators, students, parents, and community members). You may need to gather additional information as well. Existing information from your school's or district's Title I school profile, administrative records, technology inventories, and staff surveys can provide a baseline about your technology resources. Additional information may be collected through staff surveys and interviews with technical assistants and technology coordinators. Keep in mind that research says many Title I schools are housed in substandard buildings that present costly electrical and telecommunications wiring challenges. In addition, continuity is important between the hardware and software functions and distribution access, curricular goals, learner characteristics, and staff implementation skills.

By compiling a summary report of the needs assessment data, you can help develop consensus among stakeholders by providing background information to inform their decisions about the implications of this data. The following are important issues that may arise when you are planning to build your technology infrastructure:

- Provide equitable hands-on access to appropriate resources, staff, and information for learners of all ages within the community.

Case Scenario

Bridging the Learning Distances

The Tomah Area School District encompasses 500 square miles in rural south central Wisconsin. Its boundaries cover three counties. Since 1992, the district has engaged in an ongoing technology planning process. Today, it follows a blueprint for making proactive decisions rather than immediate and short-term ones. The long-term, systemic planning approach now incorporated into the district's daily operation has fostered the development of one of the more advanced technology infrastructures around. But, it did not start out that way. Under the initial 1992 plan, all the computers were stand-alone, nonnetworked Apples and MACs. Teachers were allowed to buy and use personal copies of software at will in their classrooms. There was no continuity or accountability within the curriculum for what and how students used these technology resources.

Efforts to update the district's technology plan responded to changes in state and federal technology grant requirements, as well as a shift in curricula from subject centered to student centered, from textbook driven to curriculum centered. Nancy, the director of curriculum and instruction who began in 1994, and Paul, the director of technology who began in 1995, pulled together a new technology committee during the 1997-98 school year. The districtwide committee serves as a sounding board for staff; provides a forum for brainstorming technology-related ideas and plans; acts as a consulting body, bringing new ideas to the table; and collaborates with school personnel to address classroom, building-level, and districtwide technology needs.

The district's technology infrastructure has emerged from a combination of technological and curriculum integration "know-how" among those on the technology committee. With each rotating curriculum update, Nancy and the district's teachers worked to plan for integrating technology into the K-12 scope and sequence to enhance student learning. Technology became one of the change agents within the school system and was implemented upon approval from the board for each new curriculum area. Paul, a network and software engineer, built the priority infrastructure, which was tailor-made to meet the unique needs of the district's innovative curricula.

The backbone of the district's infrastructure is comprised of a number of Windows NT™ servers connecting every computer in each of the district's 206 K-12 classrooms, teacher workrooms, administrative offices, and 17 computer labs housed in 11 buildings across the miles. District-level technical staff, trained and supervised by Paul, have worked to interface connections among different phone companies in three counties, to set up the connections among the district's buildings. Building-level electrical and network wiring has been designed for current and future technology capacity levels with state-of-the art fiber optics. Physical security is provided by a keyless entry system in all buildings and barcoding of all pieces of equipment as well as software. Electronic security is maintained districtwide with firewalls and tape backup of all data and all operating systems, providing a high level of cyber-security.

Access to the World Wide Web and e-mail is provided in each building. Teachers have one networked computer in their classrooms with e-mail and Internet on their desktops. The Internet is accessible to students through the computer labs (one lab in each of the seven elementary buildings, three computer labs in the middle school building, and seven computer labs in the high school building). Every computer in the district is linked to the district network. Every student in the district has the option of receiving a network account through which they learn about computer networking as well as content area standards. Network accounts are set up at the teacher's request, accompanied by parental/guardian written consent on the district's computer resource usage policy form. The district generated daily requirements to use its technology through e-mail communications, online curriculum development tools, integrated electronic grading and assessment methods, paperless budgeting for teachers' online work and supply requests, and interactive educational software. Many of the networked software was engineered by Paul and his staff. The district's overall philosophy is that when teachers are empowered with the skills and the purposes for using technology, amazing results occur. The staff, reportedly, has become very technology driven.

The district's electronic infrastructure helps staff manage student records, including demographics, attendance, scheduling, standardized test scores, medical information, and bus routing. Their Web site makes the K-12 curricula available to the community. In addition, televisions, VCRs, and laser disk players are available in all buildings district wide. The PEG (Public Education Government) TV Channel transmits a school community joint project used for announcements, city council meetings, and videos of interest to the community and school. The district's satellite dish enables staff to download custom-ordered programs to address students, teachers, and the community's lifelong learning needs, including foreign language learning and the Education for Employment Program. Students and staff connect to the Internet for college-level coursework available through the University of Wisconsin and Minnesota's St. Mary's College distance learning systems. One online math course is popular with high school students who interact with other online learners and college professors using satellite transmissions, the course Web site, *Mathematica* software, and e-mail communications.

The district requires all students and their parents/guardians to agree to a computer resource usage policy. Next, the district plans to implement a software adoption policy and establish curriculum subcommittees to carry it out.

Reflection Questions

✔ *What are the advantages of having a districtwide technology infrastructure as opposed to stand alone technology resources?*

✔ *What measures did the district put in place to motivate its staff and students to use their technology infrastructure?*

✔ *How would a technology infrastructure, like the one described in this scenario, change your learning environment and opportunities for students? for teachers?*

Internet Resources

An annotated list of Web sites that address the topic "Build a Technology Infrastructure" starts on page 102 of this handbook. Use these Internet resources to find research reports and evaluation methods describing how technology can play a role in student learning.

- Obtain professional technical support and mentoring from local business school-to-work partnerships.
- Facilitate development of parental partnerships and technology literacy skills.
- Telecommute with community partners from health, social service, and other organizations providing services to students.
- Keep records, monitoring progress, accountability tracking, and information gatekeeping.
- Prioritizing purchases and scheduling implementation efforts in accordance with a multiyear budgeting and professional development program.
- Connect learners and staff to mainstream social and economic resources through local area, wide area, and worldwide electronic information networks.
- Provide adequate and regularly updated hardware, software, and training to all user groups.
- Facilitate technology access for users in resource labs, classrooms, homes, and community centers.

Action Steps for Building a Technology Infrastruture

- Create a study group to engage subcommittee members and other relevant stakeholders to discuss the case scenario provided in this chapter.
- Conduct your needs assessment for technology resources using Tool #11 (see page 131). Technology resource needs should address the findings from the student, parent-community, and staff needs assessment worksheets. Refer back to Tool #2 to chart the priority goals for implementing technology within your school district.
- Use Tool #12 (see page 133) as a guide to create your own technology resource usage policies statements. See the example of one district's usage policy for this tool.

Notes:

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Establish Multiyear Funding

Objective

To determine multiyear funding strategies for implementing your technology plan and securing schoolwide improvement efforts.

Overview

High-poverty schools have special forces that impinge on their ability to fund technology improvements. The lack of a tax base makes local funds tight. Staff to monitor and write grant applications are often in short supply. There may be high turnover in the ranks of administrators and teachers, which brings with it a loss of professional development investments. Other forces that confront poor schools are high rates of student mobility and lack of parent involvement. These forces make continuity in instruction and student learning difficult, while hindering the implementation of technology.

> ***The costs of ubiquitous use of technology are modest in the context of overall budgets for public elementary education but moving to such use requires significant and potentially painful restructuring of budgets.***
>
> Thomas K. Glennan and Arthur Melmed, 1996, in *Fostering the Use of Educational Technology*

What Are the Barriers to Implementing Desired Changes?

McDermott (1997) noted several less-obvious reasons that make it difficult to implement change in large urban school districts. One was the existence of conflicts in the vision that different constituencies may have for the use of technology. Another was preoccupation with the political correctness of equity in allocating technology. Some school decision-makers may find it more politically comfortable to implement several unrelated technology initiatives at once, hoping that one of them will work and maybe even garner some media attention for the school or district. While at first glance this approach appears reasonable, it contains two flaws. One is that implementing several initiatives is more likely to lead to fragmentation than it is to systemic reform. Multiple initiatives create competitive camps that often forget that improved learning for students is the ultimate purpose of any reform effort.

Two, analyses show that spreading resources too thin across several small-scale projects for the sake of equity seldom produces significant change. It may even allocate technology to schools that are not ready to use it. Studies of successful technology-based Title I programs revealed that even as a plan for technology was being drawn up, the emphasis was still on student learning, with special attention being

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given to promoting high academic and behavioral standards. Successful implementers also tie the technology plan to real-world issues; they cultivate and publicize the links between what students were doing in school and real-word relevance. It is important to remember that with technology planning, what you get out of it has to do with the effort put into it. Educators need to be certain that the educational program is sound or else technology use will have little potential for meaningful improvement in learning.

No technology program is problem free. It is important to remember not to judge the technology as ineffective when implementation does not go according to the plan (Holmes & Rawitsch, 1993). Flexibility, patience, and adaptability are the order of the day. Issues of timelines, responsibilities, staff development, funding, and leadership are as important for technology use as they are in other areas of implementation.

Preassessment

1. Does your school have multiyear funding resources to support long-term implementation of your technology plan?
2. Are planning committee members aware of potential funding resources available to them and how to identify new sources of funds?
3. Does your technology plan successfully meet the qualifying criteria for current technology grants?

How Can a School Finance Its Technology Plan?

In high-poverty settings, grants are often the primary funding sources for technology. The use of Title I funds and reallocation of existing textbook resources to software expenditures are other strategies that schools have used to implement their technology plans. While special referendums on adding technology to schools may succeed in nonimpoverished communities, high-poverty communities usually do not have the tax base to support such moves. State governments, however, may occasionally issue special bonds or levy special taxes to pay for technology resources, network infrastructure, and computer hardware and software acquisition.

In the study, *School Technology: Five School Districts' Experiences in Financing Technology Programs* (1998), Carlotta C. Joyner, Director of Education and Employment Issues at the United States General

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Accounting Office (GAO), reported that schools used combinations of resources to fund technology. District operating budgets provided the most frequent sources of funds, but special technology levies and bonds, state and federal funds, and private and other contributions were frequently in the mix as well.

The GAO study recommends that schools address financial issues related to at least seven different but integrated technology components. These components are the following:

Hardware. School personnel usually know more about the purchase of hardware than about other aspects of technology. Hardware includes such items as computers, printers, scanners, and peripheral equipment.

Infrastructure. Technology requires connections inside and outside of schools. You may find that you need to allocate funds for building improvements such as increased electrical capacity, improved ventilation systems, and remodeling to ensure the safe use of technology.

Maintenance. Even the best equipment requires maintenance and repair. Items such as computer drives, keyboards, and printers that show wear are especially in need of regular attention.

Software. In addition to instructional and other software programs that engage your learners, you will need to add operating, application, utility, reference, and management software.

Technical Support. You will need assistance to keep your system running. Hardware and software glitches that are easy fixes for a technical expert can become major obstacles for students and teachers if there is no one to attend to them.

Telecommunications Access. This includes telephone connection and use costs as well as access and operation fees to Internet providers. It is fortunate that the recent E-rate legislation will pay up to 90 percent of the telephone connection and use costs in high-poverty schools. (More on the E-rate and its importance to schools follows.)

Training. Training is usually the most underfunded item in a school's technology allocation. Most specialists agree that at least 30 percent of the total dollars allocated for technology should be set aside for training and professional development, with a large portion of that devoted to the use of technology in mathematics, science, and reading and writing instruction.

The GAO report points out at least four barriers to obtaining the necessary funds. These funding barriers are the following: (1) competing needs, (2) resistance to higher taxes, (3) insufficient fund-raising staff or volunteers, and (4) fund-matching and cost-sharing requirements that

Case Scenario

Meeting Technology Goals Through Reallocation of Resources

Oliver Wendell Holmes Elementary School, located in an impoverished neighborhood in Detroit, was built in 1923. Deep cracks line some classroom ceilings. It's been a long time since anyone has put a coat of polish on its wood floors. But the walls show off colorful student artwork and educational posters, bookcases overflow, and classrooms all have computers. The school has an energetic staff determined to enrich their students' learning experiences.

Just as important as the learning activities teachers provide students is the emphasis the school places on the staff's own professional development. Teachers and administrators at Holmes actively participate in the Detroit Urban Systemic Initiative and are recipients of the Schools of the 21st Century Grant. In addition, they maintain Head Start, Title I and Title 31a programs, and special services for the hearing impaired at the school. Class sizes are small, ranging from 18 to 23 across the preschool through 5th grades. The staff currently has a vision for widespread implementation of technology to support meaningful, engaged learning at the school.

To implement its vision, Holmes purchased one to three multimedia PowerMacs, color printers, an overhead projector, and multilistener cassette players for each classroom, as well as an LCD panel, color scanner, and digital video camera for each floor. Grade-level staff coordinated their software purchases, although no site licenses were purchased. The district's Office of Advanced Technology provides professional development guidance and technical support as needed. Meeting many of the objectives of the Detroit District-Wide Technology Plan, however, is problematic for Holmes. Their district's plan calls for five networked computers in each classroom; a community technology-lending center; networked computer labs; a library media center; and connectivity throughout the building and to area offices, businesses, other schools, the Internet, and parents at home. One big problem is that each school in the district has to fund the technology plan through its existing resources, outside partnerships, and grant opportunities. Because the Holmes school building is old, its electrical capacity is limited to one or two outlets in each room, not enough to support the use of multiple computer workstations. In addition, wiring the old building for local area and wide area networks and the Internet presents enormous logistical and economical challenges. Although teachers have found ways for rotating children's use of the one to three computers in their classrooms, they found if difficult to provide equitable, hands-on computer access for all students with the limited number of computers.

At a technology planning meeting, the staff members discussed these problems and related their vision for using technology to support engaged learning. Through their discussion, they decided to use their existing resources to create a computer lab on a temporary basis to see if it solves some of their instructional dilemmas. Each classroom will continue to have one PowerMac to serve as the teacher's workstation. Those with more than one computer in their classroom will donate their additional computers to a central location within the building—the one classroom that already has multiple electrical outlets. Since the building is currently full but the class sizes are small, students from the classroom converted to the computer lab will be assigned to other classes. Consolidating the existing computers into a lab, the staff believes, will provide a number of benefits. It will allow them to feasibly create a local area network and potentially provide Internet access at the school. It will provide more equitable hands-on computer access for all students to develop basic technology literacy skills. Currently, many students stand and watch over the shoulder of a peer controlling the mouse. Likewise, a computer lab will better facilitate individualizing instruction on a more meaningful level for each student and enable the staff to implement a more systematic approach to schoolwide technology usage.

Having a computer lab is anticipated to actually increase the use of the computers as some of the teachers at the school use theirs regularly while others don't. Since the school does not have a library, the computer lab can serve as an electronic resource center. It also has the potential of meeting their district's goal of providing technology access for parents and community members. During off hours, the lab can become a community technology center providing a place for parents to increase their own technology skills and access online resources.

Reflection Questions

- ✓*What were the problems associated with the original allocation of technology resources in the school?*
- ✓*How does funding for technology effect implementation and planning for technology on a multiyear basis?*

are difficult to meet. Most people agree that maintenance, training, and technical support are the most difficult to fund. The reason is, in part, that while schools can show off their new hardware and software, they can't package maintenance, training, and technical supports as easily, so it remains less visible to policymakers and to the media.

In 1995, cost estimates for developing a school technology system ranged anywhere from $180 to $501 per pupil (Hawkes, 1998). Ongoing annual costs ranged from $40 to $105. The number of computers in a school and whether the school had access to the Internet accounted for the variation.

Federal Programs

Federal programs are the next most likely source of funding. The 1997 Resource Guide to Federal Funding for Technology in Education (available at http://www.ed.gov/Technology/funding.html) describes 30 programs in eight federal agencies that fund technology in schools. The following excerpt, developed by Julie Kaminkow in the Office of Educational Technology, highlights those that are especially relevant for K-12 education:

Technology Literacy Challenge Fund supports efforts to meet the four national technology goals for schools (modern computers, high-quality educational software, trained teachers, and affordable connections to the Internet) through leveraging state, community, and private funds.

Star Schools Program provides telecommunications equipment and programming to underserved students, especially those living in urban and rural areas.

Technology, Educational Media, and Materials for Individuals with Disabilities Program is an important source of funding for students with disabilities.

National Challenge Grants for Technology in Education are awarded to consortia which must include at least one local educational agency with a high percentage of children living below the poverty line. Each year there is a different focus for grants.

Title I is dedicated to helping low-performing, disadvantaged children achieve high standards. It funds one-third of the cost of hardware and software in K-12 schools. Title I also offers many opportunities for technology-related professional development.

Eisenhower Professional Development State Grants fund teacher training, with a high emphasis on mathematics and science instruction.

Goals 2000: Educate America Act helps parents, teachers, and community leaders improve their schools.

The Universal Service E-Rate

The Universal E-rate for schools and libraries defrays some of the costs of telecommunications. Unfortunately, even as this document is being written, the funds available to schools through this program are being dramatically reduced. Originally, the technology discounts for schools and libraries ranged from 20 to 90 percent, depending on poverty levels and whether the school or library was located in either an urban or rural area. The latest changes restrict most of the funding to schools and libraries in high-poverty communities.

Much of the information on the E-rate in this document summarizes information on Web sites developed by the National Exchange Carrier Association, the North Central Regional Technology in Education Consortium, and the Northwest Educational Technology Consortium. It is a good idea to visit these Web sites yourself for more details on the Universal Service E-rate. The sites contain other valuable information including sources of information about the availability of funds. The Web sites are listed in the Internet Resources section for Chapter 7.

The Federal Communications Commission (FCC), which is implementing the E-rate legislation, has ruled that to be eligible for a discount, a service or hardware must be "an essential element in the transmission of information within the school or library." This ruling means that the discounts apply to the installation and ongoing costs of all telecommunications services, Internet access, and internal connections, including telephones, that telecommunications companies provide for use in instructional areas. As a result of the FCC order, the Schools and Libraries Division (SLD) and the Universal Service Administrative Corporation have been established to manage the program.

The SLD adopted the following position statement on eligible services: "The primary purpose of the services for which support is sought must be the delivery of services to the classrooms or other places of instruction at schools and libraries that meet the statutory definition of an eligible institution. Support for the administrative functions of library or education programs is permitted so long as the services are part of the network of shared services for learning. Support will be limited to services delivered to the onsite educational facility or facilities."[1]

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[1] Schools and Libraries Division. (1997). Formal position statement adopted by Schools and Libraries Corporation Board of Directors on November 20, 1997. CC Docket 96-45.

Questions and Answers about the E-Rate

Is Participation Automatic?

Participation is not automatic. To receive a discount, you must file an application with The Schools and Libraries Division. Application forms are available online at http://www.slcfund.org.

Who can apply?

Applications will be accepted from schools, districts, or groups of school districts. Both public and private schools are eligible. As noted, it appears that because of limited funds, only schools with high poverty will be funded. For FY 1999, the deadline was March 16, 1999.

How big a discount can my district and school get? Is there a maximum on the discounts available?

Discounts range from 20 percent in wealthy districts to 90 percent in rural areas with very high rates of poverty. Discounts are based on the number of students in a school district who qualify for free or reduced-price lunch. If a district is classified as rural, because of higher installation costs, the discount rate will be slightly higher.

The FCC has capped the Universal Service Fund for schools and libraries at $2.25 billion each year. Some modifications were made during the first 18 months of the program and a lesser amount was available. The discounts will be processed on a first-come, first-served basis until a total of $2 billion has been allocated. The remaining funds will be reserved for districts with high poverty rates. Funds not spent will be available for use the following year.

What expenses are eligible for discounts? Is the cost of staff development included?

The discounts apply only to costs associated with installations, internal connections, maintenance of internal connections, telecommunications services, and Internet access including communications links to Internet Service Providers (dial-up or leased line) and e-mail. Costs associated with hubs, network file servers, and wireless LANs are also eligible for discounts. Only computers and computer software that function as servers and are required to provide telecommunications services to instructional areas can be included. Costs associated with professional development and training are not eligible for discounts.

What does the application process require?

In addition to completing the necessary forms, the application process requires institutions to have completed:

- An inventory of technologies that already exist in the institution.

- A technology plan approved by an independent agency, such as a state education or library agency. (For the 1999 funding year, applicants are also required to submit a budget with the technology plan.)

It is also recommended that schools write a request for proposals (RFP) describing the services they are seeking. Service providers can review the RFP to understand exactly what services the applicant is requesting. For a sample RFP form, go to Tech Discounts for K-12 Schools and Libraries (available: http://isbe.state.il.us/learn-technology/technopages/FCC/Default.html) and look for "RFP template" in the left column. (Note: You need a Netscape Plug-In to download this file.)

Technology planners should also keep in mind that the E-rate alone will not provide sufficient funding for the development of a technology infrastructure. Schools need to see the E-rate as just one source of funding to help them develop a successful technology plan.

Where can I get further information on the E-rate?

The SLD has a toll-free number (888-203-8100) to handle E-rate questions. Questions also can be submitted by fax (888-276-8736) or e-mail (question@slcfund.org). The SLD's E-rate application Web site and the Web site of the National Exchange Carrier Association (NECA) have a variety of guides for E-rate applicants. (Check both sites, since each has materials not available at the other.)

EdLiNC (Education and Libraries Networks Coalition) has an unofficial E-rate hotline (800-733-6860) as well as a complementary hotline Web site (available: http://www.eratehotline.org/) that includes information about using the telephone service, a database of answers to E-rate questions, and additional background on the E-rate program.

Internet Resources

An annotated list of Web sites that address the topic "Establish Multiyear Funding" starts on page 104 of this handbook. Use these Internet resources to find more information about specific grants and technology funding sources for your technology plan.

Action Steps for Establishing Multiyear Funding

- Create a study group to engage subcommittee members and other relevant stakeholders in discussing the case scenario provided in this chapter.
- Review the technology-related needs that were identified in your comprehensive needs assessment report and identify those that are underfunded. Conduct the necessary research to obtain special funding for those technology needs not currently accounted for in your school or district's budget. If your district does not have a grant writer, partner with a local college or university to stimulate collaboration for obtaining and managing new grants.
- Review how to best leverage the various sources to develop a total funding package. For example, E-rate does not pay for staff training but many other education programs, such as Eisenhower, do. Some funding, such as Technology Challenge grants, are short term while others, such as Title I, have much more long-term stability.

Notes:

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Evaluate Processes and Outcomes

Objective

To examine the implementation processes for developing your infrastructure and the outcomes as they relate to student learning.

Overview

The purpose of evaluating the implementation processes used in developing your technology infrastructure and the outcomes related to student learning is to get timely feedback and constructive criticism on any revisions or adjustments to your technology plan that may be necessary. Evaluation also helps ensure that your technology infrastructure is aligned with your school's overall vision for improvement. Evaluating your development progress will also give you insight into your technology use and its impact on student learning. In short, evaluation is a valuable tool for pulling together perspectives from students, teachers, parents, and staff about how well the technology serves their purposes.

> ***An important contribution that evaluators can make is to question the goals, the activities, and the outcomes of programming supported by the constituted authorities, whether they are right, left, or green, and bring different views to bear.***
>
> Carol Hirschon Weiss, 1991, in *Evaluation and Education: At Quarter Century*

Previous chapters in this handbook described action steps involved in identifying and planning to meet the technology needs of your students, staff, parents, and community members. Each chapter contained key criteria for developing and using a technology infrastructure effectively. In this chapter, your technology planning committee will be attempting to identify key project outcomes and the related indicators that help decide along the way if those outcomes are being achieved or if they need to be modified.

There are five major steps to putting together an evaluation report that identifies and describes the impact of technology in your school or district. Despite large variations in resources, schools, districts, and partnerships, committees can use these steps to guide their evaluations. The steps are the following: (1) focusing the evaluation, (2) designing the evaluation, (3) collecting information, (4) analyzing and interpreting information, and (5) reporting information. This chapter describes each of these steps.

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Preassessment

1. Does your school or district systematically evaluate its technology planning and implementation process and outcomes?
2. Do the types of outcomes addressed in the evaluation measure the impact of technology on student learning and staff performance?
3. Does your evaluation plan include gathering data from all stakeholder groups about technology implementation in your school or district?
4. Is your evaluation plan flexible enough to accommodate new questions, information sources, and analysis procedures when necessary?

Focusing the Evaluation

To focus your evaluation, your evaluation planning team should identify what it wants to evaluate and how it is going to evaluate it. It should always keep the purpose of the evaluation in mind. The purpose might be to revise or adjust the technology plan, to document the technology implementation process to provide information on what technical assistance may be needed; or to measure the impact of technology on students, teachers, and/or parents. Or, the evaluation might target all of these purposes.

The same people who participated in your comprehensive needs assessment activities can help your technology planning committee focus the evaluation and identify key purposes. While it may not be possible to accommodate everyone's evaluation concerns, drawing on their ideas will alert your planning team to a broad range of evaluation interests. Students, parents, and teachers are the anchors of any worthy technology evaluation process.

Evaluation activities too often take place at the end of the project, when systems are up and running. By then, it is too late for evaluation to play a role in the development of a technology program. A much better course of action is to conduct the comprehensive needs assessment and identify curriculum and instructional priorities with an eye toward evaluating them on an ongoing basis. This keeps your committee realistic about what it is able to accomplish. Making evaluation an ongoing part of the technology planning process helps you to refine your instructional and implementation goals and to document your changes as you go along.

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Designing the Evaluation

An evaluation design is both a process and a set of written plans or products. The building blocks of evaluation are guiding questions, such as those suggested below. Your evaluation questions should be aligned with the purpose of your evaluation. They should also draw on some of the latest research on how technology might most appropriately be used in the classroom.

Guiding Evaluation Questions

Process Questions

- What events and methods describe how the implementation of technology in your district influenced student learning?
- What support structures help the technology infrastructure development process achieve district goals?
- Are your schedule, equipment deployment, and facility coordination being implemented as planned?
- What professional development efforts help teachers to learn to use technology in functional and engaging ways for student learning and administrative duties?
- How does the integration of technology and the learning resources it brings into the classroom change instructional techniques?

Outcome Questions

- What instructional practices are in place to support engaged student learning? authentic student learning?
- Has engaged learning with technology affected learner attitudes and motivation?
- How well do students perform on standardized measures of achievement where technology was used to support learning?
- How has teaching with technology affected teachers' workloads and methods?

Student and teacher learning outcomes are central to any evaluation in schools. Research over the last several decades recommends that technology used to improve student learning deploy instructional strategies that effectively engage students in discussion, debate, analysis, interpretation, and judgment (Jones, Valdez, Nowakowski, & Rasmussen, 1995). Indicators of student achievement are another key to evaluating learning through technology. While standardized test scores are valid and widely used barometers for determining achievement, they are not the only valid measurement for the impact that technology use has on student learning. Technology systems can be set up to capture and report rich, descriptive assessment data using student portfolios and assessment rubrics.

Regardless of the indicators you choose to assess your technology program by, you should be aware of a potential problem. The most difficult question researchers and evaluators have faced in assessing the impact of educational technologies is whether the variables being measured are in fact correlated with the forms of learning we wish to facilitate. Associated with this problem are the lack of well-defined, well-accepted metrics for the evaluation of educational technologies that are sensitive to impacts of a learner-centered nature. So, if you feel like you have to make the world of technology fit into the big picture of schooling, then you're not alone. But you are on the right course, for it's likely to be more productive to determine what role the technology plays in comprehensive curricular improvement than it will be to isolate effects of technology in specific areas.

Attitudes of technology users are also important. While there is no guarantee that students who react positively to using technology as a learning tool will significantly increase their learning, negative student reactions most certainly will impede learning. Assessing teachers' attitudes about the use of technology is particularly important. Where technology is concerned, teachers often feel they are the victims of change rather than change agents themselves. Because attitudes toward technology have been linked to such important outcomes as willingness to undertake development in technology-supported activities, resistance to technology use, and success in using technology in a new context (Keith, 1993), understanding the processes that shape these attitudes is essential to developing interventions to improve them.

The evaluation can be loosely constructed or have a rigid design. Either way, it will always include a purpose and focus; strategies for collecting, analyzing, and reporting the information; and a data management plan.

Tasks at this stage of evaluation planning include determining who will be responsible for gathering information and from what sources they will gather it (students, teachers, standardized tests, and/or attitudinal surveys). Articulating who will participate in the analysis, and what analysis procedures they will use, are also part of the evaluation design. Finally, identifying evaluation audiences and deciding how evaluation information will be disseminated to those audiences rounds out the general design. Ideas for collecting, analyzing, and reporting information are discussed below.

Collecting Information

There are several ways to gather information to answer your evaluation questions. You can collect information from people, documents, performance data, and observation of events. Similarly, there are a number of methods for gathering information, including traditional measurement approaches such as tests and ratings, as well as more investigative procedures such as observation, interviews, case studies, and literature review. Each of the chapters in this handbook contains key criteria for the development and use of an effective technology infrastructure. If you employ these criteria as a guide, the first part of your evaluation will really be an audit in the sense that you will be looking retrospectively at the work you've done and determining if it meets the needs of all end users.

Analyzing, Interpreting, and Reporting Evaluation Information

Analysis is the process of finding out what your information means and what conclusions it will support. For survey information, item mean scores generally suffice. For behavioral indicators, such as absences and tardiness, frequency counts or percentages will do the job. These analyses are descriptive and comparable. You can use them to measure your progress from year to year.

To interpret your analysis, the best thing to do is to go to other stakeholders for their perspective. This involves presenting all of the evaluation information to teachers, board members, and/or administrators and asking them how technology accounts for the differences in scores or observations. With these insights in hand, you will be ready to draw some summary conclusions.

The purpose of reporting is to communicate what you've learned to interested parties and to help them use the information in their daily practices with students. But reporting involves more than just communicating the findings of the evaluation. Your evaluation report will be more useful if it also includes information about the context, activities, results, and implications associated with integrating technology through the school and community. And, certainly, it should be balanced, clear, and grammatically and technically sound.

Your technology planning committee should keep in mind that reporting is not the end of evaluation or a one-time event; nor is it necessarily a product like a written report. Reporting is an ongoing process that can be oral, written, visual, or a mix of these. Think of novel ways to use your technology infrastructure to disseminate your evaluation information to all stakeholders.

Evaluation Has Many Audiences

- ✓*Funders and supporters such as a private corporation or a utilities commission.*
- ✓*Oversight agencies or advisory boards such as local school councils, school boards, or parent leaders.*
- ✓*Clients such as schools and district administrators.*
- ✓*Teachers, parents, and students.*
- ✓*Libraries, museums, resource centers, and clearinghouses.*
- ✓*Hardware and software vendors.*

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Case Scenario

Evaluating Technology-Enriched Learning Activities

Waukegan is a highly multicultural district in northern Illinois. Its five-year evaluation plan is designed to assess and document the implementation of the Waukegan Technology Learning Collaborative project (TLC). The TLC project is designed to promote the use of high performance technology to support and promote engaged learning. The project received initial funding during the 1995-96 school year. The five Waukegan middle schools were the first wave of schools in the district to be engaged in the TLC Challenge Grant. TLC consists of a consortium of educational institutions, private businesses, and government agencies that are collaborating to build a technology infrastructure that will support their efforts to modernize and improve education within the district.

The district's community members experience many of the problems common to inner city systems: high truancy rates, widespread poverty, high mobility, and low academic achievement. TLC is addressing these problems by implementing a community-wide mathematics and science education program based on innovative uses of new technologies. The program relies on school-home, school-community, and school-work components. It proposes extensive professional development and addresses targets of the Goals 2000 Act. More than 7,000 students in grades 5-12 will directly benefit from the program. The goals of the TLC project are to do the following:

- Improve students' achievement in math and science.
- Increase the use of engaged learning strategies by teachers and students, with a particular emphasis on project-based, collaborative learning strategies.
- Increase the effective use of high-performance technology in mathematics and science by students and teachers.

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- Increase students' and adults' knowledge and skills for workplace readiness.

Student learning at Waukegan is tested with traditional testing vehicles such as the ISAT (Illinois Standard Assessment Test), CAT (California Achievement Test), SABE (Spanish Assessment of Basic Education), and IMAGE (Illinois Measure of Annual Growth Exam) to name a few. Comparing test scores before and after using technology measures some of the improvement in students' skills. However, these standardized measurement methods do not fully capture the scope of engaged learning and the impact of interactive technology tools. While standardized test results show important evidence of achievement when compared to a "norm," the district also needs other measures of student learning that more directly assess higher-order thinking skills and technology literacy.

The district is currently designing these authentic assessment vehicles. Standardized testing companies are also beginning to look at revising their tests to match the new "norm" found in technology-rich learning environments. The district's authentic assessment methods will be administered to targeted classrooms and to non-targeted classrooms to demonstrate the project's impact on students' higher-order thinking and technology literacy skills. Teachers are compiling student portfolios to demonstrate students' progress in using technology effectively.

Students' project portfolios were used by the district to help evaluate teachers' progress understanding and applying engaged learning principles and technology to enhance student outcomes, particularly in math and science. The portfolios had been maintained by Waukegan staff since the first full implementation year of the grant in 1996-97 and underwent expert review of technology supported curriculum units sampled at various grade levels. The portfolios showed progress in teachers' use of engaged learning strategies, technology integration into the curriculum, and increased student responsibility and motivation of learning.

Upon completion of the project, questionnaires will be distributed to the school councils of the targeted schools, the parents of students in the targeted classrooms, teachers of the targeted classes, students in targeted classrooms, district administrators, and the TLC program collaborators to elicit their opinions about the impact of this project on schools, student learning, and student motivation.

Reflection Questions

✓*How does the district integrate technology into its academic goals for student learning?*

✓*Why is the district investing in developing authentic assessment instruments to measure student achievement?*

Internet Resources

An annotated list of Web sites that address the topic "Evaluate Processes and Outcomes" starts on page 105 of this handbook. Use these Internet resources to find research reports and evaluation methods describing how technology can play a significant role in student learning.

Not all of the information that you will have collected during your evaluation is likely to be pertinent to all of your audiences. An audience of parents will certainly have different interests in evaluation information than a group of administrators. You will want to carefully select the information and format used to share evaluation reports with difference audiences. Also, try to avoid information overload.

There is general consensus that presenting evaluation findings as "dialogue" has more impact on audiences than simply announcing the results. To generate this kind of interaction, submit draft evaluation reports or summaries to your audience for their review before you meet with them. Conducting open forums or meetings, making yourself available at other meetings as information unfolds, and sharing information at staff and/or faculty meetings are other ways to keep your audiences involved with using technology and in-the-know.

Evaluation Provides Perspective

Anyone who has built a schoolwide technology program will confirm that daily realities often produce outcomes that are very different from the goals and plans that were projected early in a project's development. The role of evaluation is to help you account for those realities as you make technology a part of your instructional and administrative program. Evaluation activities help determine the clarity of your goals, their fit to your context, if adequate input has been given to the decisions at hand, and whether these decisions provide sufficient guidance for implementing technology plans.

Action Steps for Evaluating Technology Implementation and Outcomes

- Create a study group to engage subcommittee members and other relevant stakeholders in discussing the case scenario provided in this chapter.
- Revisit your needs assessment report and the priority goals set for implementing technology. Focus your guiding questions for the evaluation around these goals, your technology vision, and school improvement objectives.
- Use the technology evaluation rubric, Tool #13 (see page 137) in the Toolkit, to assess your technology implementation process and outcomes. As the evaluation data informs your technology efforts, revise or adjust your technology plan accordingly.

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Final Thoughts on Technology Planning

Education in a technology-rich environment is a dynamic, interpersonal learning experience for both teachers and students. Teachers become more familiar with each of their students' learning styles, personal interests, and achievement progress. Students have the opportunity to explore personal interests and abilities and interact more closely with their peers, parents, and community members. Students also learn vital lifelong learning skills such as how to generate and access valuable assessment data about themselves and share their knowledge with others in meaningful ways.

Joann Lyle, a teacher at Lansdowne Junior High School in East St. Louis, recently said, "I've been teaching for 24 years. But this is my first year teaching in the Writing Enrichment Lab, where all of my students have hands-on access to a networked computer, word processing, and the Internet. And this is the first year I can see that I'm making a difference!" That's a powerful statement from a seasoned teacher. If only all teachers could experience that level of success integrating technology into their teaching practices. Technology, when used instrumentally to empower the learner to achieve a learning goal, has great potential. Getting there depends much on the efforts of technology planners and those in leadership positions who listen to and support implementation of recommendations compiled through the technology planning process described in this handbook.

Educational leaders are proposing systemic reforms requiring changes that are crucial for schools to consider in order to meet the ambitious Goals 2000 and other exemplary visions for education in the 21st century. Yet, it is well established that sound educational changes take time. Educators may be hesitant to make the sweeping changes necessary for systemic reform. Effective change does not come without adequate planning, vision, professional development, evaluation measures, technology resources and new institutional modes of operating. All told, technology is a vital component of systemic reform leading to school improvement.

Internet Resources

Develop a Vision and Policy

The Closing the Equity Gap in Technology Access and Use: A Practical Guide for K-12 Educators Web site, hosted by NWREL's Northwest Educational Technology Consortium, contains a number of valuable resources, including checklists of questions to help assess building/district access issues and possible strategies, online forms to help plan for technology, various links to additional resources, and a useful bibliography to view reference information.

Available online at www.netc.org/equity

Equity 2000 Mission is the College Board's districtwide (K-16) education reform model that promotes educational excellence for all students. The goal is to close the gap in college attendance and success rates between minority and non-minority, advantaged and disadvantaged students, so that all students will be prepared to achieve success in their formal education and in their careers.

Available online at www.collegeboard.org/index_this/equity/html/mission.html

The Guidebook for Developing an Effective Instructional Technology Plan, from the National Center for Technology Planning, was developed as a graduate studies project at Mississippi State University and is a comprehensive and highly readable document on the technology planning and implementation process. Its scope is broadly inclusive and covers every aspect of a well-written plan, making it an excellent general resource for the technology planner.

Available online at www.msstate.edu/~lsa1/nctp/guide.html

The Institute for Research on Poverty at the University of Wisconsin-Madison has indexed Web sites as resources for researchers interested in a number of poverty-related issues, including education, public policy, children and families, urban issues, and welfare reform. This Web site is a compendium of resources and reviews, of which the site states: "The following resources are not under the control of the Institute for Research on Poverty. They are merely listed here as a resource for researchers. Any notes or classifications are based on the cataloguer's opinion based on a brief 'visit' to a site."

Available online at www.ssc.wisc.edu/irp/povlinks.htm

The Joint Center for Poverty Research at Northwestern University/University of Chicago is a national and interdisciplinary community of researchers whose work advances the understanding of what it means to be poor and live in America. This site can help educators and administrators fulfill their vision to include an understanding of poverty within their schools and district.

Available online at www.jcpr.org/

The National School Boards Association (NSBA) asserts that their mission is to foster equity and excellence in all aspects of public education in the United States through school board leadership. Their site is essential to school board members wanting the information services NSBA offers, including upcoming conferences and seminars, publications, training opportunities, and advocacy activities. School leaders who access this network of resources may find it helpful in creating their empowering vision.

Available online at www.nsba.org

The Northwest Educational Technology Consortium (NETC) believes that using technology effectively means first considering its uses and potential. This site looks at technology plans from the Northwest and from across the country, providing access to research concerning the planning process. This site is of particular use in Step 1—Develop a Vision—because the information deals with the impact of technology on educational reform and how the vision must adapt to the changing world in which students live.

Available online at www.netc.org/tech_plans/

Technology and Education: An Investment in Equity and Excellence is the transcript of a speech by Secretary of Education Richard W. Riley, given at the National Press Club on July 28, 1998. Riley describes technology and education as having a "critical relationship" that will bridge the gap, or "digital divide," in access to technology that is seen across different socioeconomic strata in our country today. By fostering technological equity in American schools, Riley sees the promise and possibility of a bright future for all Americans.

Available online at www.ed.gov/Speeches/980729.html

Western Washington University's Technology Coordinator's Web Site addresses issues concerning the planning for and coordination of technology into the educational environment. The site is divided into three sections: The Work of the Technology Coordinator, Planning for Technology Integration, and Professional Development for Technology Integration. This site examines key roles in technology planning in accordance with a long-term empowering vision.

Available online at www.ac.wwu.edu/~kenr/TCsite/plan.html

Analyze Technology Needs

The Institute for Learning Technologies at Columbia University maintains this index to resources about the **Coalition of Essential Schools (CES)**, an ambitious school reform project focused on improving classroom teaching and learning by considering the role of technology in school reform. Planning committees who want to examine model schools and their technology programs will find this site useful; there are a host of ideas they can incorporate into their own school's plan.

Available online at www.ilt.columbia.edu/k12/livetext/readings/small.html#ces

Co-NECT helps schools and districts use technology for whole-school change and improved academic results, working with schools in communities around the country to revitalize teaching and learning by using sustained professional development. Educational administrators and technology planners seeking to plan and incorporate successful technology programs into their schools and districts will find this site valuable.

Available online at http://co-nect.bbn.com/

The Educational Resources Information Center (ERIC) index has links to the 17 ERIC clearinghouses, ERIC catalog, U.S. Department of Education, National Library of Education, and several other relevant educational resources. Visitors can search the ERIC database, read abstracts or entire articles, and give feedback on the services and information at the site. This index is useful for educational administrators, parents, and teachers seeking to build a well-rounded knowledge base.

Available online at www.accesseric.org:81

ERIC's Information and Technology Clearinghouse, located at Syracuse University, is one of 17 clearinghouses in the ERIC system. They specialize in library and information science as well as educational technology. ERIC/IT acquires, selects, catalogs, indexes, and abstracts documents and journal articles in these subject areas for input into the ERIC database.

Available online at http://ericir.syr.edu/ithome/

Hosted by the North Central Regional Educational Laboratory, **Learning Through Technology: A Planning and Implementation Guide** examines seven critical issues in the planning process: Perspectives about Education, Planning to Plan, Building a Knowledge Base, Establishing General Directions, Implementing Priorities and Strategies, Evaluating Progress, and Institutionalizing.

Available online at www.ncrel.org/tandl/homepg.htm

The Mid-continent Regional Educational Laboratory (McREL) in Denver maintains this index to resources about the impact of technology on education. This site provides information about technology's uses and effects within schools, including a study of school uses of TV and video, reviews of research on computers across the secondary curriculum, and a review of Internet "Report Cards," all of which can be used to broaden the scope of one's technology planning process by examining the technology already being used in certain schools.

Available online at
www.mcrel.org/connect/tech/impact.html

The National Center for Education Statistics (NCES) sponsors this index to resources about important recent surveys and data in the field of education. Educators and technology planning committees can seek studies, surveys, and data, accessing solid information to help them understand and plan for technology.

Availlable online at
http://nces.ed.gov/surveys/datasurv.html

Hosted by the North Central Regional Educational Laboratory, *Pathways to School Improvement* is an award-winning repository of "timely topics" and "critical issues" ranging from parent and family involvement to professional development. Policymakers, administrators, and teachers wanting access to information related to school improvement should use this site.

Available online at
www.ncrel.org/pathways.htm

The Institute for Learning Technologies at Columbia University maintains this index to resources about School Reform Networks & Initiatives as part of its Readings Group about Small Schools and Their Networks.

Available online at www.ilt.columbia.edu/
k12/livetext/readings/small.html#schoolnet

The ERIC Clearinghouse on Urban Education is a valuable resource, and the Urban Education web (UEweb) is a subdivision listed here. This site offers access to manuals, brief articles, annotated bibliographies, reviews and summaries of outstanding publications, and conference announcements in urban education. Users have a wide variety of options, including finding out about UEweb, searching its database, discovering what's new in the field, and linking to the World Wide Web. Visitors can submit articles and receive feedback concerning questions they may have about anything within this area of study. This site can be instrumental both to building a knowledge base and to defining curricula with your students' specific needs in mind.

Available online at http://eric-
web.tc.columbia.edu/

Focus on Student-Centered Learning

The ERIC Clearinghouse on Adult, Career, and Vocational Education is maintained by the Center on Education and Training for Employment (CETE) at Ohio State University. This site provides information vital to vocational education planners wanting further resources concerning referrals, orientations, and workshops to help develop skills in using ERIC search services, consultation in developing strategies for searching the ERIC database Web site, and assistance with accessing ERIC through the Internet. Users have the option of submitting articles for online publication and receiving feedback from others in the field.

Available online at http://ericacve.org

Bilingual Books for Kids is a commercial site that distributes materials written with Spanish and English appearing side-by-side. These books introduce bilingual skills, increase language and learning abilities, and heighten cultural awareness. Their catalog includes multicultural games, biographies, poetry, juvenile fiction, and southwestern stories and legends. This site is included here as a possible curricular resource.

Available online at www.bilingualbooks.com/

The University of Calgary in Alberta, Canada, hosts the **Children's Literature Web Guide**. It is an excellent resource for teachers, parents, and students interested in children's books. This guide has many great features, including teachers' commentaries, discussion groups, and current listings of the Newberry and Caldecott award winners. As one of the most popular online resources about children's literature, we believe this site is the hub of children's literature resources on the Web. Some of our favorite parts of this site include the "What's New?" section, lists of "Best Books," the reviews of books, and the Forum. This site is included here as a possible curricular resource.

Available online at www.ucalgary.ca/~dkbrown/

The **Eisenhower National Clearinghouse** for Mathematics and Science Education seeks to raise national standards in math and science. ENC's new Web project, TIMSS@ENC, gives teachers, parents, and education leaders the resources they need to understand and reflect upon the Third International Mathematics and Science Study. ENC hopes this data will help determine how practitioners can examine what they do in the classroom. Educators can then ask themselves if there are ways to improve their teaching and their students' learning practices so that every learner can achieve at high levels.

Available online at www.enc.org/reform/index.htm

The **Global Schoolhouse**, sponsored by Microsoft, links kids around the world, creating a "connected" learning community. The site includes educational resources that are available to parents and teachers, while kids and teens are exposed to contests, online publications, and cyberfairs that have been created just for them. Schools can register themselves at this site, and technology planners can find examples of schools that use technology effectively when searching for ways to improve the technology implementation process at their own school.

Available online at www.gsh.org/

The Annenberg/CPB Math and Science Project presents **Journey North: A Global Study of Wildlife Migration**, which uses data supplied by schoolchildren to track the migratory habits of different wildlife. This site is included here as a possible curricular resource. Visiting this site with children can be a wonderful way to integrate computers into the science classroom.

Available online at www.learner.org/jnorth/

The Computer Learning Center, from the group known as Leadership, Education and Athletics in Partnership, is a virtual scavenger hunt for 9- to 11-year-olds along the **Boston Freedom Trail**. Students study maps, photos, and a timetable for answers to clues based on historic places from the Revolutionary War. This site is included here as a possible curricular resource. Students also can be encouraged to use this fun and educational site in their free time.

Available online at http://leap.yale.edu/lcic/hunt/bosfreet911.html

This ERIC Clearinghouse on **Languages and Linguistics** index is maintained by the Center for Applied Linguistics, a private nonprofit organization. ERIC/CLL collects and disseminates online information pertaining to foreign languages, current developments in education research, instructional methods and materials, program design and evaluation, teacher training and assessment, English as a second language, and bilingualism and bilingual education. This site is wonderful for ESL teachers, teachers in linguistically diverse schools, and parents concerned about the implications of bilingual education. The latest articles, research, and surveys can be accessed from this clearinghouse's Web site.

Available online at www.cal.org/ericcll/

The **Learning Technology Center** (LTC) at Vanderbilt University is a collaborative, multidisciplinary group of approximately 70 researchers, designers, and educators who are internationally known for their work on technology in education. Members of the LTC oversee a variety of research-based projects in the areas of mathematics, science, social studies, and literacy. This site contains valuable information concerning LTC's background, purpose, research, and future projects.

Available online at http://peabody.vanderbilt.edu/ltc/general/

The Institute for the Learning Sciences at Northwestern's School of Education & Social Policy maintains this site called **Learning Through Collaborative Visualization**. CoVis is a virtual learning community with thousands of students, over 100 hundred teachers, and dozens of researchers working together to find new ways to think about and practice science in the classroom (such as atmospheric and environmental science) and to improve science education in middle and high schools. This site is included here as a possible curricular resource.

Available online at www.covis.nwu.edu

The Education Division of the **National Center for Supercomputing Applications** champions productive use of emerging computing and communication technologies to advance education, science, business, government, and society. Projects include the Education Course: Emerging Technologies in Science, Education, and Business. The course is designed for students interested in understanding new technologies and scientific methods for use in education and/or the workplace. For example, Riverweb seeks to construct interdisciplinary, digital knowledge networks for the Mississippi River Basin, while Chickscope follows the day-by-day development of the baby chick from conception to hatching. This site is included as a possible curricular resource.

Available online at www.ncsa.uiuc.edu/edu/

The **National Institute for Literacy** maintains this site, which lists literacy facts, current events, forums, listservs for educators involved in literacy, and directories to other links. The purpose of NIFL is to enhance the national effort to achieve full literacy by the year 2000. NIFL seeks to do this by creating a national support system for literacy. We recommend this site as a good entry point into the home pages sponsored by the federal government. It provides connections to regional hubs, state literacy resource centers, the National Adult Literacy and Learning Disabilities Center, and the Literacy Americorps home page. This resource may be valuable for technology planners seeking to assess and correct the challenges posed by literacy in high-poverty, urban settings.

Available online at http://novel.nifl.gov/

The Space Science Laboratory at **NASA's Marshall Space Flight Center** maintains this colorful and fascinating site devoted to all aspects of science that relate to space travel and exploration: astrophysics, microgravity science (space processing), biotechnology, and Earth science. This site is included here as a possible curricular resource.

Available online at www.ssl.msfc.nasa.gov/

The **Ontario Institute for Studies in Education** maintains this site, which primarily serves as a description of the research, development, and uses of the CSILE software. An important feature of this Web site is that it contains a demonstration of how the software works. CSILE (Computer Supported Intentional Learning Environments) is a computer program that provides across-the-curriculum support for collaborative learning and inquiry. Students and their teachers can create a communal database, entering text and graphic notes on any topic. Students using CSILE software can then read the notes and comments, building on the ideas of others.

Available online at http://csile.oise.on.ca/intro.html

Primary and Secondary School Internet User Questions is sponsored by the Consortium for School Networking (CoSN), a nonprofit organization that advocates the use of telecommunications in K-12 education to help students achieve new educational standards. CoSN hopes to improve policies concerning school networking by building a strong broad-based coalition. This site has links to information on the E-rate and teacher training in advanced technology. Teachers, especially those on technology planning committees, can take advantage of this site's wide array of information on funding, getting connected, and technology use in the classroom.

Available online at http://cosn.org/

The Space Science Laboratory at NASA's Marshall Space Flight Center maintains this colorful and fascinating site devoted to all aspects of science that relate to space travel and exploration: astrophysics, microgravity science (space processing), biotechnology, and Earth science. This site is included here as a possible curricular resource.

Available online at wwwssl.msfc.nasa.gov/

The Science Learning Network, funded by Unisys and the National Science Foundation, explores how telecomputing can support inquiry-based science education. This site has a marvelous cache of resources and links that will spark the interest of any budding young scientist, including virtual museum visits, a Monarch Migration project, and other resource links. This site is included here as a possible curricular resource.

Available online at www.sln.org/

The ERIC Clearinghouse on Social Studies/Social Science Education is sponsored by the Social Studies Development Center (SSDC) of Indiana University in Bloomington, Indiana. Their Web site contains information on the literature and developments made in the field of social studies and science. The clearinghouse's site can serve K-12 teachers, students, parents, administrators, educators, policymakers, researchers, and others interested in the latest information on social studies and the social sciences.

Available online at www.indiana.edu/~ssdc/eric_chess.htm

The Institute for Learning Technologies at Columbia University maintains this index to resources about **Telecommunications Project Design** as part of its Readings Group about Internet-Based Project Design. Included in this site are links to online journal articles, papers, and studies. Guidelines for designing online collaborative projects, strategies and hints for finding or organizing online projects, and advice on selecting and choosing projects are also available. This site can be useful to technology planners wanting input on incorporating Internet projects into their curricula.

Available online at www.ilt.columbia.edu/k12/livetext/readings/telecom.html#telecom

At wNetSchool's Kravis Multimedia Education Center, you can access outstanding lessons for core curriculum topics, specific strategies for using technology in the classroom, and the rich resources of Thirteen/WNET, public television's flagship station. Here are some of the many things you'll find at wNetSchool: monthly bulletins, an Internet primer, lesson plans, selected site reviews, software samples, and product discounts. This site is included here as a possible curricular resource.

Available online at www.wnet.org/wnetschool/

The Institute for Learning Technologies at Columbia University maintains this hypertext document, the **WWW Constructivist Project Design Guide**, designed to help initiate experienced educators into building constructivist, cooperative learning projects around the World Wide Web. This site serves technology planners as a resource on constructivist theory, the Internet, and the ways in which technology can be effectively incorporated into the classroom by bridging self-directed learning with the variety of resources available on the Web.

Available online at www.ilt.columbia.edu/k12/livetext/curricula/general/webcurr.html

Involve Parents and the Community

Ask Dr. Math is a Math Forum Project that is maintained by Swarthmore College. This is an excellent Web site for parents, teachers, and especially children. The Math Forum home page is divided by grade level and is designed to answer K-12 math questions. Parents and mathematics teachers can also benefit from this site's forum by asking questions regarding new methods, teaching techniques, innovative curriculums, and math education concerns.

Available online at http://forum.swarthmore.edu/dr.math/

The Institute for Learning Technologies at Columbia University maintains this index to resources about Career Counseling as part of its Resources Group on Student Services: Guidance & Funding. The Resources Group is divided into four categories: career counseling, test preparation, financial aid, and college searching. Within each category are links to Web sites offering more in-depth information. This site can be a wonderful resource for teens considering college. It also serves as a tool the community can use to foster awareness of post-high school options among its students.

Available online at www.ilt.columbia.edu/k12/livetext/resources/guidance.html#coun

Children Now is an organization that serves as an advocate for children. Their Web site is a resource for parents, educators, social service professionals, and others concerned with the welfare of children. This Web site offers parenting advice, up-to-date information on laws affecting children, kid-centered current events, children's health issues, and links to different agencies focusing on issues for and about families. Other topics of note in this site include statistical information and interpretation about our nation's children, children and the media, and family economic security.

Available online at www.dnai.com/~children/

ERIC Counseling and Student Services (CASS) is an online database that serves anyone who has a need to access information related to counseling and student services. Included at the CASS site is a virtual library, digest collections, and a database that has articles and abstracts on psychology and social work; student development; career, family, marriage, mental health, and school counseling; and parent, student, and teacher education in human resources. This database is an excellent resource for those in education, but will also prove helpful to parents who wish to search for the latest in teaching trends and follow what is going on in their children's classrooms.

Available online at www.uncg.edu/~ericcas2/

Created by Dr. Ken Boschert at Washington University, the **Electronic Zoo** specializes in resources for veterinarians and animal lovers. It is an online compendium of information about animals, animal care, and veterinarian medicine, featuring links to indexes, organizations, mailing lists, discussion groups, and other pages about animals and veterinarians. The Electronic Zoo's audience can range from veterinarians and animal lovers to science students. This site is included here to involve families in their children's education through a broadly interesting and commonly shared topic.

Available online at http://netvet.wustl.edu/e-zoo.htm

As a virtual museum visit, the **Exploratorium** Web site is both fun and educational. San Francisco's Exploratorium hosts this interactive site that can be used by children and adults. The site includes links to interactive online exhibits as well as access to job listings, membership information, and museum hours. Teachers, parents, and students can use this site to learn about science, art, history, and human perception. The Exploratorium Web site demonstrates community involvement in two ways: it shows a specific community involved in making learning more creative and fun, and can also involve the urban community in the educational process through its range of exhibits and activities.

Available online at www.exploratorium.edu/

Families and Learning is a project cosponsored by the Child and Family Policy Center at Vanderbilt University and the University of Minnesota's Children, Youth, and Family Consortium. It has a number of sections, one of which points to articles and research on the varied aspects of families and learning, including current and/or seminal research findings. Another section, called the Family Re-Union 6 Conference Web Site, covers the conference sponsored by Vice President Al Gore; the University of Minnesota's Children, Youth, and Family Consortium; and Vanderbilt University's Child and Family Policy Center. The conference brought together more than 1,000 parents, educators, and corporate and community leaders from around the nation to focus on the critical issue of family involvement in children's education.

Available online at www.cyfc.umn.edu/Learn/

Family Involvement in Children's Education, from the U.S. Department of Education, is an "idea book" profiling successful local approaches that foster parent partnerships with education. Recognizing that community involvement fosters successful schools, this site is an important resource for buildings and districts seeking to bridge families and schools.

Available online at www.ed.gov/pubs/FamInvolve/

Kid's Web, sponsored by Syracuse University, presents students with a kid-friendly version of the Web. The site's links are simple to navigate and contain information targeted at the K-12 level. The four subsections: arts, sciences, social studies, and miscellaneous are understandable and interesting to students. This site can be used as both a curricular resource and as a site for kids and families to explore together.

Available online at www.npac.syr.edu/textbook/kidsweb/

Created by Jeff Erickson, a graduate student at Duke University, **Mathematical Games, Toys, and Puzzles** includes actual games that students can play, as well as reviews of commercially available games. Links to other math sites are also available at this location. This site could be used at both school and home under the guidance of a teacher or parent. The games and articles are challenging, though, and some may be too advanced for students to do alone. But they can be tackled collaboratively to show how fun and interesting math can be.

Available online at www.cs.duke.edu/~jeffe/mathgames.html

The Institute for Learning Technologies at Columbia University maintains this index to resources about **Museums, Exhibits and Family Sites** as part of its Curricula Group in Science. This Web index includes links to science museums and family sites where visitors can access exhibits, schedules, and museum information, such as parking, hours, etc. This is a great reference for science and math teachers, as well as parents and students.

Available online at www.ilt.columbia.edu/k12/livetext/curricula/science/exhibits.html

The **National Parent Information Network** is a project sponsored by two ERIC clearinghouses: Urban Education at Teachers College, Columbia University; and Elementary and Early Childhood Education, University of Illinois at Urbana-Champaign. NPIN fosters the exchange of quality parenting materials. Parents and those who work with parents receive information about raising, teaching, and encouraging children to be successful. Full texts of brochures and publications for parents and those who work with parents are provided, along with materials that can be downloaded for free. This site has a question answering service, Internet resources, parent discussion lists, information specific to minorities, parenting calendar of conferences, and other events.

Available online at http://npin.org/

Parent Education Resources provides resources and links for parents and teachers of young children. It is most appropriate for focusing on preschool and kindergarten children. One article asks: "Is your child ready for kindergarten?" Elsewhere, a Kindergarten Survival Handbook is provided. A question-and-answer section addresses some of the most common questions parents have about kindergarten, including the curriculum, social skills, role of play, and types of activities. This site also provides links to related resources.

Available online at www.parent-education.com

The **PEP Registry of Educational Software Publishers**, sponsored and created by the group Parents-Educators-Publishers, is valuable for anyone interested in quickly accessing information about a known publisher. The site is a compendium of links to over 1,000 publishers, and parents and teachers can find information about products they may be considering purchasing.

Available online at www.microweb.com/pepsite/Software/publishers.html

Parents and Children Together Online, a project of the Family Literacy Center at Indiana University, is a magazine for parents and children on the World Wide Web. This site includes original stories, poems, and articles for parents and children. A recent issue included articles on selecting quality children's literature, motivating adolescent readers, and helping children overcome reading difficulties. The site also provides other resources for parents, some of which can be downloaded for free.

Available online at www.indiana.edu./~eric_rec/fl/menu.html

Partnership for Family Involvement in Education is a Department of Education-sponsored site designed to help parents become more involved in their children's education. There are some great resources available at this site, many of which teachers can download and print out for free. We were pleased with the quality of the brochures, such as "Get Involved: How Parents and Families Can Help Their Children Do Better in School" and "Summer Home Learning Recipes." They are informative, easy to read, and very appropriate for sharing with parents.

Available online at http://pfie.ed.gov/

Reaching All Families: Creating Family-Friendly Schools, from the U.S. Department of Education, presents fresh ideas on school outreach strategies (from parent resource centers and positive phone calls to open houses and parent-teacher conferences) that will reach all families and help involve them in their children's education.

Available online at www.ed.gov/pubs/ReachFam/

The Smithsonian Institution is America's treasure chest of learning, a huge collection of interconnected museums and exhibits, which provides a wealth of information on a wide variety of subjects. Students can visit any of the Smithsonian museums in what amounts to a "virtual tour." This is a valuable resource for those who don't live close enough to these museums for a firsthand field trip.

Available online at www.si.edu/organiza/

Housed by the ERIC Clearinghouse on Urban Education, **Strong Families-Strong Schools** is an online article about building community partnerships for learning. This site will be very helpful for those looking for ways to build home-school partnerships. Created in the form of an electronic book, the site presents seven chapters that explain the "why's" and "how's" of building strong links between schools and communities. Detailed suggestions are discussed for building bridges among families, schools, businesses, government agencies, and communities. This site offers concrete examples about how strong familial involvement benefits children's education and is included here as a resource for involving families and communities in developing a technology plan that will have positive effects for their children.

Available online at http://eric-web.tc.columbia.edu/families/strong

The Thinking Fountain, sponsored and created by the Science Museum of Minnesota, is valuable to children interested in learning and discovering new things about science. The site is fun and easy to navigate. Parents, science teachers, and children can explore this site together and submit their own science experiments and findings.

Available online at www.sci.mus.mn.us/sln/

The White House includes links for both adults and children. One page answers questions about the government, another contains White House tour information, while another is just for kids (White House for Kids). Users can take a virtual tour of the White House and access the top news events of the day. This Web site can be used in a history, social studies, or civics class, or can be visited just for fun.

Available online at www.whitehouse.gov/WH/Welcome.html

Support Professional Development

The 21st Centurty Teachers Network, sponsored by University of Phoenix, is a national volunteer effort that encourages teachers and others using educational technology to develop new skills for using technology in their teaching and learning activities. The Web site includes education and technoltoy news, an event calendar, a resource library, lists of colleagues for collaboration, and information on how to join both local chapters of 21st Century Teachers and the national network itself (membership is required for access to some parts of the Web site).

Available online at http://www.21ct.org

The California Instructional Technology Clearinghouse gives "exemplary" or "desirable" ratings to CD-ROMs for students in grades K-12 in a searchable database of more than 2,000 recommendations. With seven strands of criteria to use for searching, teachers can look for software programs that fit their specific classroom needs.

Available online at http://clearinghouse.k12.ca.us/

The Illinois Math and Science Academy site is committed to providing teachers with a meaningful professional development experience and the opportunity to field-test innovative curricula in math, science, and technology education. IMSA's programs, resources, organizations, administration, and publications are described at this site, and teachers can use ideas and lessons from the Summer Adventure programs.

Available online at www.imsa.edu/edu/

Created by Mid-continent Regional Educational Laboratory, **Internet Connections** links to sites ranging from interactive learning pages to essays about block scheduling and planning for staff development. Teachers, parents, and students can use this index to access sites specific to their needs. Teachers can find innovative lesson plans and curricular approaches, parents can learn about classroom structuring and how it affects their children's learning, and children can access a host of interesting educational Web sites.

Available online at www.mcrel.org/connect/integ.html

The mission of the **National Staff Development Council (NSDC)** is to ensure success for all students by serving as the international network for those who improve schools and by advancing individual and organizational development. The NSDC has established national standards aimed at giving schools, districts, and states direction in what constitutes quality staff development. Its newest initiative, Results-Based Staff Development for the Middle Grades, identifies staff development programs in core content areas that have increased the achievement of middle school students.

Available online at www.nsdc.org

National Standards for Technology in Teacher Preparation. The National Council for Accreditation of Teacher Education (NCATE) is the official body for accrediting teacher preparation programs. The International Society for Technology in Education (ISTE) is the professional education organization responsible for recommending guidelines for accreditation to NCATE for programs in educational computing and technology teacher programs.

Available online at www.iste.org/Resources/Projects/TechStandards/intro.html

Nebraska's Educational Service Unit #7 houses NDE Academic Standards, advertisements of job openings, an essay on developing students' Internet research skills, and a number of links under the banner Curriculum/Class Management/School Improvement. This site is also helpful to teachers and administrators looking for professional staff development models.

Available online at http://gilligan.esu7.k12.ne.us/~esu7web/resources/teach.html

The National Council for Accreditation of Teacher Education (NCATE) is the official body for accrediting teacher preparation programs. The International Society for Technology in Education (ISTE) is the professional education organization responsible for recommending guidelines for accreditation to NCATE for programs in educational computing and technology teacher preparation.

Available online at http://www.iste.org/Resources/Projects/Techstandards/into.html

The New Teacher's Guide to the U.S. Department of Education contains information on federal grants and programs, national education goals, and services provided by the DOE. If your school is looking for grant money, ideas for professional development, or free resources to share with parents, we urge you to visit this site.

Available online at www.ed.gov/pubs/TeachersGuide

Working together to empower children with technology is the motto behind the **PEP Registry of Educational Software Publishers**. PEP provides a comprehensive list of educational software companies with direct links to their Web sites. A total of 1,183 companies comprise the registry, which was developed to inform parents and educators about software developers.

Available online at www.microweb.com/pepsite/index.html

The Association for Supervision and Curriculum Development (ASCD) maintains these resources on **Problem-Based Learning and Thematic Curricula**. At this ASCD site, users can access the Electronic Exchange, forums, question-and-answer sessions, a guestbook, educational issues, and connections to other related sites. Problem-Based Learning (PBL) and the concomitant issue of the Thematic Curricula are important, current educational reform issues. This site is included here for teachers and others who wish to gain an understanding of these issues.

Available online at www.ascd.org/services/library.html

The **Putnam Valley, NY, school district** maintains this home page, which is a model of what the Internet can provide for parent-teacher-district communication. Included in this site are New York state standards and frameworks, and links to an index of annotations on sites that focus on K-12 educational standards and curriculum frameworks, as well as descriptions of the district's 2nd grade Fairy Tale Project and the 7th grade trip to Boston. This site is included here because it offers insight into the operation of a connected community and school district; you can see parent and teacher input reflected in their curriculum and technology planning.

Available online at http://putwest.boces.org/

The **SchoolNet Software Review Project** (SSRP), sponsored by the Eisenhower National Clearinghouse, is a unique Web site that evaluates science, mathematics, language arts, and social studies software programs for K-4 classrooms. A team of teachers and SSRP staff, in accordance with national and state of Ohio standards, developed the protocol for the software reviews. At this site, you can view an alphabetical listing of software ratings, do searches for reviewed software, and read or download documents, instruments, and other materials. The database is an excellent and comprehensive resource; teachers can use this site in the planning of content area lessons and units, while technology planners can use this as a resource in their technology integration plan.

Available online at www.enc.org/rf/ssrp/

The ERIC Clearinghouse on **Teaching and Teacher Education** indexes abstracts and other education-related materials. Users can request information in the subject areas of teaching; teacher education; and health, physical education, recreation, and dance by keying in specific search terms. This Web site is a wonderful resource for current teachers or anyone considering entering the profession.

Available online at www.ericsp.org/

TrackStar, maintained and operated by South Central Regional Technology in Education Consortium, links users to annotated URLs inundated with savvy, thought provoking, and fun lesson-plans. This site can be of particular use to teachers looking to innovate their curriculum with online lessons. Teachers can also guide students through the cache of information to some of their favorite subjects.

Available online at http://scrtec.org/track/tracks/t00285.html

The NCSA Technology Research Group's **Web Resources for Educators** links to resources for K-12 teachers that are divided into seven subject areas: art, English, geography, health, math, science, and social studies. Each subject leads to a listing of related sites. By clicking on the art button, for example, you can visit the Global Art Project, the Peace in Pictures Project, the Crayola Crayon factory, a gallery of cave art from the dawn of man, and the world-famous Art Institute of Chicago. Teachers can take innovative lesson plans from the site as well as navigate with their students.

Available online at www.mcrel.org/connect/integ.html

Build a Technology Infrastructure

Building Security, from the London Metropolitan Police, offers a valuable look at the critical and often overlooked security issues that must be dealt with to ensure success in planning for technology. Because premises containing large numbers of computers face a disproportionate risk of crime, it is essential to establish a secure perimeter. This site lists suggestions for protecting your hardware and software.

Available online at www.met.police.uk/police/mps/mps/cprevent/chips2.htm

The Institute for Academic Technology maintains this bibliography on materials related to **Computer Classroom and Laboratory Design**. The bibliography provides references to off-line articles and other reference materials that support Kotlas' contention that incorporating computer technology into the education process also involves redesigning the physical space where instruction takes place. Articles in this guide provide examples and advice on modifying existing classrooms to accommodate new technologies, as well as on designing and building new teaching environments.

Available online at www.iat.unc.edu/guides/irg-03.html

This site is the online bookstore of the Institute of Electrical and Electronics Engineers' (IEEE) **Computer Society**. Book topics include software engineering, software management, distributed computing, JAVA programming and CORBA, Internet computing and VRML, visualization and imaging, design and test, communications and networking, parallel computing, high-performance computing, intelligent systems, object-oriented computing, database systems, security/electronic commerce, computer history, general interest and reference, real-time systems, and standards. These books can be ordered online, and are valuable for schools/districts seeking resources on connectivity, hardware and software.

Available online at http://computer.org/cspress/

The Institute of Electrical and Electronics Engineers' **Computer Society's** "Highlights" page has links to new member services, software engineering as a profession, the magazine Internet Computing, an online catalog, and all back issues by year of Computer Society 95-97 on CD-ROM. This site is valuable for technology planners who wish to keep informed on technical issues relating to hardware, software, and connectivity.

Available online at http://computer.org/highlights.htm

The Center for Information, Technology, and Society (CITS) and the Educational Products Information Exchange Institute (EPIE), with funding from the John D. and Catherine T. MacArthur Foundation, have produced a report, entitled **Creating Learning Communities: Practical, Universal Networking for Learning in Schools and Homes**. Subtitled *A Report for School and Community Technology Planners* and Policymakers, this tool is for those who make networking decisions and are concerned about the practicality of achieving technological implementation for their schools and communities.

Available online at www.cosn.org/resources/EPIE.html

Illinois Community Networks is a site developed at the University of Illinois at Urbana-Champaign. Though last updated in October of 1997, the Illinois Community Network's Web site contains some pertinent information from their conferences concerning the connectivity of schools in the state.

Available online at www.conted.ceps.uiuc.edu/Ilnetwork/

This section of the **Institute for Learning Technologies'** site is intended for technology coordinators and teachers working together to develop networked learning environments in their schools. Beginning with examples of technology planning guides, it provides primers on the use of networks for communication and collaborative planning. Topic areas include technical support, funding and purchasing, software reviews and downloads, Web page construction, Web site design, a communications table, e-mail and listservs, bulletin boards and telnets, and electronic journals.

Available online at www.ilt.columbia.edu/k12/livetext/resources/

KickStart is an initiative sponsored by the United States Advisory Council on the National Information Infrastructure. At this site, you can access online versions of two major publications—*KickStart Initiative: Connecting America's Communities to the Information Superhighway,* which helps community leaders kick start their communities onto the Information Superhighway, and *A Nation of Opportunity: Realizing the Promise of the Information Superhighway,* which sets forth the mandate and mission of the United States Advisory Council on the National Information Infrastructure.

Available online at www.benton.org/Library/KickStart/

NASA's **Quest Project** provides support and services for schools, teachers, and students seeking to fully utilize the Internet and its underlying information technologies as a basic tool for learning.

Available online at http://quest.arc.nasa.gov/

Resources for Web Site Developers, from the North Central Regional Educational Laboratory, lists some of the best Web sites on technology news, Web design and development tools, security issues associated with maintaining a Web site, telementoring capabilities, and educational uses of the Internet.

Available online at www.ncrel.org/tandl/internet/internet.htm

Strategies for Allocating Computers is a brief paper from the Stanford Research Institute and the U.S. Department of Education that outlines approaches for providing computers to schools, and it provides some valuable answers to the critics who question "over-technologizing" schools without direction. It also provides links to outlines of the implementation strategies of other schools and describes their allocation programs.

Available online at www.ed.gov/pubs/EdReformStudies/EdTech/computer_allocation.html

A 250-page online document, **The Switched-On Classroom**, outlines a 12-step technology planning and implementation process for public schools and is the result of a collaboration between software company executives and five public school systems in Massachusetts. It contains instructive narratives, exemplary case studies of successful technology implementation, and an extensive listing of resources that will assist schools in their strategic planning efforts for technology. The "Switched-On Classroom" links to over 150 case studies and resources.

Available online at www.swcouncil.org/switch2.stm

The Institute for Learning Technologies at Columbia University maintains this index to resources about **Technology Planning Guides and Acceptable Use Policies** as part of its Resources Group about School Technology Planning Guides and Examples. The sponsors contend that pedagogy and technology are mutually reinforcing, and so the mixture of links look at technology infrastructure in support of school reform. Also available are links to over 30 sites covering areas such as nationally recognized technology plans and test-beds, censorship and copyright issues, and technology planning index sites.

Available online at www.ilt.columbia.edu/k12/livetext/resources/techplan.html

TechWeb: The Technology News Site has daily updated news about computer technology. The latest stories and developments on computer, network, and Web technology are posted here, and the site also allows for searches on any related topic. TechWeb will return related articles published in any one of over 20 online and computer magazines.

Available online at www.techweb.com/

Web66: A K-12 World Wide Web Project describes Ethernet network components and gives instructions for setting up school networks with Internet capabilities. This site helps you analyze and understand modern computer networks and provides enough information to enable you to watch over and understand the activities of the network provider or consultant. The information on building networks is solid, basic, and crucial, and it should be of value to the technology planner wishing to understand this important aspect of connectivity.

Available online at web66.coled.umn.edu/Construction/Default.html

Establish Multiyear Funding

The **E-Rate Hotline**, developed by the Education and Library Networks Coalition, contains background information on the E-rate, application information, and frequently asked questions.

Available online at www.eratehotline.org/

The Northwest Educational Technology Consortium (NETC) hosts **E-Rate Primer**, which provides basic information on the E-rate in nine sections: Overview, Background, Documents, Frequently Asked Questions, Internet Resources, News Notes, Ruling Summary, State Action, and Timeline. This site has good detailed information about the E-rate and how to apply for discounted rates.

Available online at www.netc.org/fcc/

The **Empowerment Zone and Enterprise Community (EZ/EC) Program**'s motto is: "Building Communities Together." EZ/EC is a Presidential initiative designed to afford communities opportunities for growth and revitalization. The Web site contains valuable information on how rural and urban schools can benefit from the EZ/EC Initiative.

Available online at www.ezec.gov/

The **Resource Guide to Federal Funding for Technology in Education** is maintained by the U.S. Department of Education and is a wonderful source of information concerning the funding of technology programs. This site has a list of funding agencies, including the DOE, National Science Foundation, Department of Defense, and many more. Technology planning committees should visit this site to find out more information on funding strategies.

Available online at www.ed.gov/Technology/tecguid.html

The U.S. DOE also offers Nine Steps You Can Take Now to Prepare for the Schools and Libraries Universal Service Program as part of its Education Technology Initiatives, where technology planners can find information about the planning process, funding strategies, and the E-rate.

Available online at www.ed.gov/Technology/ninestep.html

Technology Integration: Focus on Curriculum, Learning, and Instruction is an educator resource listing sponsored by the Mid-continent Regional Educational Laboratory (McREL). These pages provide some of the best online resources available to help educators, administrators, and parents answer common questions and solve problems related to the implementation and use of technology in education.

Available online at www.mcrel.org/resources/technology/index.asp

Technology Planning and Technical Support, from the South Central Regional Technology in Education Consortium (SCRTEC-Nebraska), provides links to resources on grant information, planning, technology support, and answers to technology questions. Some links are specific to Nebraska schools and districts, but we feel that other links are useful guides to design and make decisions for technology integration into schools and districts.

Available online at http://scrtec-ne.unl.edu/SCRTECNE/Planning.html

The Institute for Learning Technologies at Columbia University maintains this index as part of its Readings Group about **Technology Policy & Educational Reform**. All of the links are annotated, and full-text articles are generally available at each linked location. Locations have information from examples of programs integrating technology to articles looking at the "myth of the Superhighway." Most links look at the implementation of technology, though there are some that provide information on funding strategies.

Available online at www.ilt.columbia.edu/k12/livetext/readings/techpol.html

The North Central Regional Technology in Education Consortium (NCRTEC) hosts this site on the Universal Service Fund (E-Rate), which includes information on the E-rate application process, sample application forms, and eligibility requirements. This site also provides E-rate updates, management and implementation recommendations, an overview of critical issues, state contacts, and links to other sites providing information on the use of technology in classrooms.

Available online at www.ncrtec.org/capacity/erate/index.html

What Should I Know about ED Grants? is an online paper from the Department of Education, answering questions about how to apply for educational grants, how the review process is conducted, and how to operate under different grants. This is general, but essential, information about educational grants.

Available online at www.ed.gov/pubs/KnowAbtGrants/

Evaluate Processes and Outcomes

The ERIC Clearinghouse on Assessment and Evaluation is maintained by the College of Library and Information Services at the University of Maryland. This site's goal is to provide users with information and resources that encourage responsible testing and assessment means. Contained here is a full-text library, a searchable database, research, national test scores, surveys, and a variety of other information pertaining to assessment and evaluation. Teachers, administrators, and policymakers are especially encouraged to view this site to gain insight into accurate assessment of students' abilities, skills, and potentials.

Available online at http://eric-Web.tc.columbia.edu/links.html

"Did Anybody Learn Anything?" Assessing Technology Programs and the Learning Accomplished discusses assessment of technology programs and their impact on student achievement. The author calls for measurable research results. A variety of hypotheses are presented to account for the scarcity of research on the efficacy of computer-mediated instruction, including school districts' inability and/or reluctance to launch evaluation procedures due to lack of resources or lack of support for this process.

Available online at http://fromnowon.org/~mckenzie/fnodec95.html

An Educator's Guide to Evaluating the Use of Technology in Schools and Classrooms. Developed through funding by the Office of Educational Research and Improvement in the U.S. Department of Education, this guide offers evaluation information to individuals who have little or no formal training in research or evaluation. The guide comes with worksheets and basic evaluation principles to put district and school personnel on the path of evaluating their local technology initiatives.

Available online at www.ed.gov/pubs/EdTechGuide/

Sponsored by the Mid-continent Regional Educational Laboratory (McREL), **The Impact of Technology—Surveys, Bibliographies, and Literature Reviews** lists several recent research studies focusing on the evaluation of educational technologies, specifically addressing relationships between the new technologies and student learning at the elementary and secondary levels. Information is also available that shows major outcomes consistently shown for students and teachers that result from technology, as well as technology development and applications to support teaching and learning.

Available online at www.mcrel.org/connect/tech/impact.html

Hosted by WestEd, a nonprofit research agency dedicated to improving education and part of the Regional Education Laboratory (REL) system, **Implementing Technology in Education: Recent Findings from Research and Evaluation Studies** is a detailed look at the process of planning for technology.

Available online at www.wested.org/techpolicy/recapproach.html

The **Learning and Performance Support Laboratory** (LPSL), affiliated with the College of Education at the University of Georgia, conducts research and development projects exploring how computational and communication technologies can be used to enhance learning and performance-support environments. The link to the current projects' page may interest technology planners for its sub-link to a project, entitled Evaluation of Digital Multimedia Distance Learning System.

Available online at http://lpsl.coe.uga.edu/lpsl20.html

Technology Planning
Toolkit

The following are suggested ways for using the worksheets, forms, and rubrics compiled in this Toolkit.

Tool 1: When your committee is ready, use this worksheet to focus the collaborative community planning process and record your community's vision for integrating technology into schoolwide improvements (see page 109).

Tool 2: The Comprehensive Needs Assessment Chart, is designed (see page 111) to help compile the comprehensive needs assessment findings. The information summarized on the chart should reflect common categories and themes that emerged across all four steps of the needs assessment process described above.

Tool 3: Assign a subcommittee to compile student achievement data and then record the data on this Student Needs Assessment Worksheet (see page 113).

Tool 4: Teachers planning to integrate technology into student-centered learning activities can use this Technology Integration Planning Chart (see page 114) to pull all the pieces of the puzzle together. A sample activity plan is also provided for discussion purposes. For more information on compiling your own planning chart, refer to the *Teacher's Guide* that accompanies this handbook.

Tool 5: For fun, have students of all ages do this Basic Technology Terms Crossword Puzzle (see page 117). Then hold a hands-on demonstration of each term. Students also can use the Internet or CD-ROM encyclopedias to research a technology topic associated with their own interests and design an original crossword puzzle to challenge their classmates and build vocabulary.

Tool 6: Sponsor a Family Technology Event to increase parents' awareness and hands-on experience with the types of technologies the school plans to purchase. Arrange for community volunteers to use this Parent Technology Survey form (see page 119) or conduct short parental interviews during the event to collect parental needs assessment information.

Tool 7: Use these Parent-Community Needs Assessment Worksheets (see page 121) to compile and synthesize the findings from your parent-community needs assessment data.

Tool 8: Conduct a parent involvement program that culminates in signing this "Partners in Learning With Technology" student-parent-teacher-administrator agreement form (see page 123).

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Tool 9: Conduct a thorough staff needs assessment and compile findings using this Staff Needs Assessment Worksheet (see page 125).

Tool 10: Use this Technology Proficiency Chart (see page 127) with teacher teams to create their own technology proficiency levels of use relevant in their school context. Teachers can then use the chart to self-assess their progress as well as mentor others in area(s) where they have excelled personally.

Tool 11: Conduct your needs assessment for technology resources using this Technology Resources Needs Assessment Worksheet (see page 131). Technology resource needs should address the findings from the student, parent-community, and staff needs assessment worksheets. Refer back to Tool #2 to chart the priority goals for implementing technology within your school district.

Tool 12: Use this Technology Resource Usage Policy Template (see page 133) as a guide to create your own technology resource usage policies statements. See the example of one district's usage policy for this tool.

Tool 13: Use this Technology Evaluation Rubric (see page 137) to assess your technology implementation process and outcomes. As the evaluation data informs your technology efforts, revise or adjust your technology plan accordingly.

Tool #1: Develop a Vision Worksheet

Write an overall vision statement about the role of technology in the school and identify the important beliefs that undergird that vision:

____

____

____

____

____

____

Review the important, standard-based learning goals for the students in your community. Are there technology literacy learning goals for all students? If not, this will need to be a part of the planning process:

____

____

____

____

____

____

Describe the ongoing roles and responsibilities for parents and community members involved in helping to design and support technology for learning:

____

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____

Describe the roles and responsibilities of the school or district staff involved in designing and implementing a technology plan that helps students achieve learning goals:

Define the expectations for how technology applications will be used to address and extend student learning goals across the curriculum:

Identify the policy issues related to your vision statement:

Tool #2: Comprehensive Needs Assessment Chart

Target Group→	Student Learning Needs	Parent-Community Needs (Staff & Resources)	Organizational Needs
Information Needed			
What are the essential learning goals?			
What are the existing strengths to enable reaching these goals?			
What are the primary barriers to reaching these goals?			
What are the primary action strategies to overcome barriers?			
What are the empowering uses of technology to achieve goals?			
What are ways for assessing the impact of technology on reaching goals?			

Tool #3: Student Needs Assessment Worksheet

The guiding question for the K-12 student needs assessment is: *What are the essential learning outcomes for our students at their developmental level(s)?* The objective is to identify learning goals and priorities that can be met through uses of technology.

Our vision statement specifies the following essential *student learning goals:*

Our students' *existing strengths* for achieving this vision are:

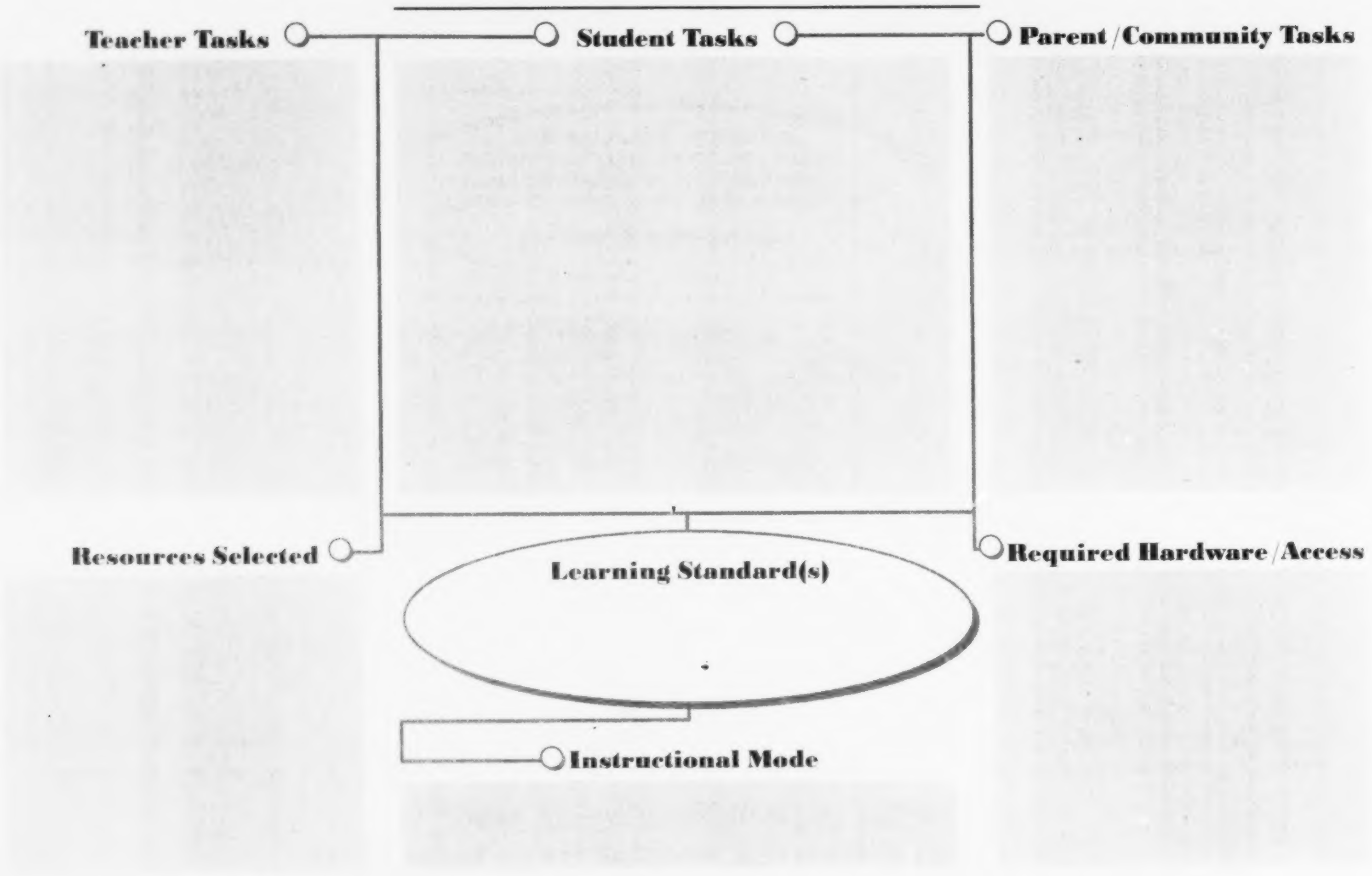
Our students face the following *primary barriers* to achieving this vision:

Key *action strategies* to help our students overcome these primary barriers are:

Empowering *uses of technology* to facilitate and enhance student learning are:

Ways to *assess the impact* technology has on student learning goals are:

Tool #4: Technology Integration Planning Chart


Teacher Tasks
Student Tasks
Parent/Community Tasks
Resources Selected
Learning Standard(s)
Required Hardware/Access
Instructional Mode

Technology Integration Planning Chart

Mrs. Jones' 6th-Grade Science Fair Project

Teacher Tasks

Identify learning standard(s) and key concepts

Select technology resources

Create assessment rubric and activity log template

Assign students to learning teams

Schedule and hold team conference meetings with students

Monitor teams' rotating use of technology resources

Keep assessment log with of Team Review reports from Rainforest Researcher™

Provide parents with Internet tips

Student Tasks

Formulate individual and team questions to be answered

Research scientific professions using the Internet (e.g., taxonomist, chemist, ecologist, ethnobotanist)

Rotate leadership responsibilities within learning team

Read workbook, view video clips, and complete all quizzes on Rainforest Researcher™ CD-ROM

Provide teammates with appropriate information to help solve scientific problem

Monitor individual and team progress using assessment rubric and activity log

Compile PowerPoint® report recommending scientific solution(s) and create interactive problem-solution scenario with HyperStudio™

Compile unit portfolio and prepare for Science Fair

Parent Community Tasks

Provide access to the Internet at home, library, or community center

Monitor Internet research homework on assigned scientific profession

Individually tutor child in area(s) of weakness(es)

Participate in Science Fair

Resources Selected

Rainforest Researcher™ CD-ROM (6 copies) and workbook for each student

Microsoft PowerPoint® (6 copies)

HyperStudio™ (6 copies)

The Rainforest Alliance Home Page
http://www.rainforest-alliance.org

The Global Schoolhouse's Introduction to the World Wide Web
http://www.gsn.org/WEB/_lib/_html/soregion/webintro.htm

Learning Standard(s)

Students will demonstrate knowledge of interactions among components of the rain forest ecosystem and basic uses of electronic reference tools and the Internet for information research

Instructional Mode

Role playing as an assigned scientific professional on a collaborative team whose mission is to solve a semi-structured problem using available productivity technology and human resources

Required Hardware Access

Minimum of one multimedia computer for each team of four students accessible between 10-11:30 a.m. daily for three weeks

Compatible LCD panel for practicing Science Fair presentations 10-11:30 a.m. daily for one week

Multimedia computers (6 total) set up for Science Fair

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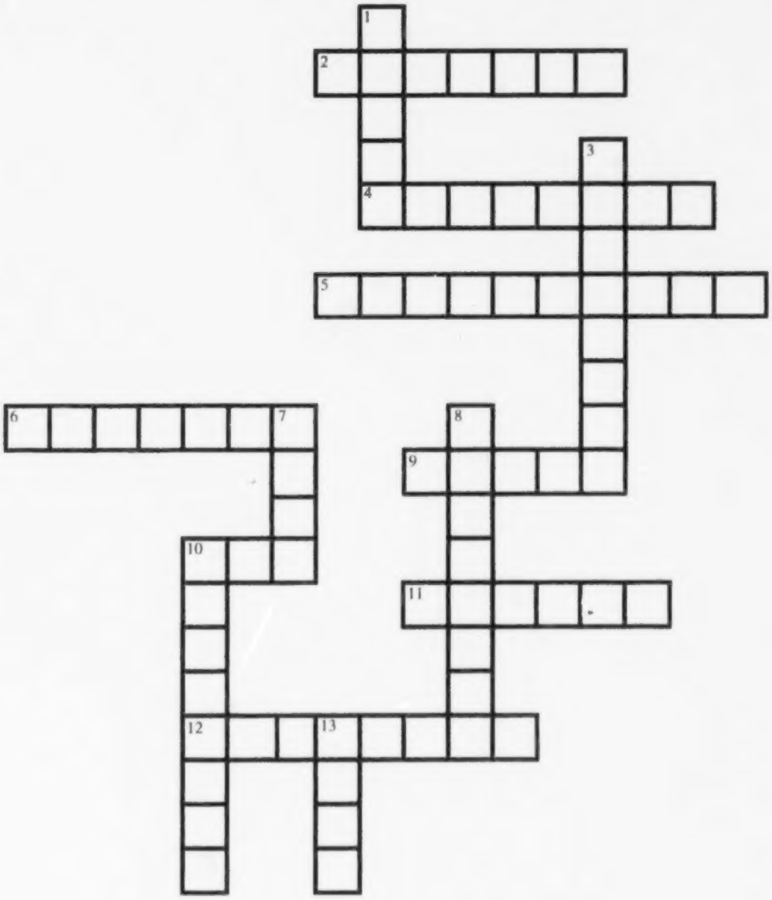
Tool #5: Basic Technology Terms Crossword Puzzle*



ACROSS

2) An output device that displays text and graphics from a computer.

4) A set of electronic instructions that tells your computer what to do

5) A device used to store information (2 words)

6) Instructions that tell a computer what to do

9) A handheld device used to move or select items on the screen

________.

10) Central Processing Unit (abbr.)

11) A flashing symbol on the screen that tells where your next entry will be

12) An input device that looks like a typewriter

DOWN

1) The styles of type available on a computer

3) Any part of the computer you can see or touch

7) A list of commands for you to choose from

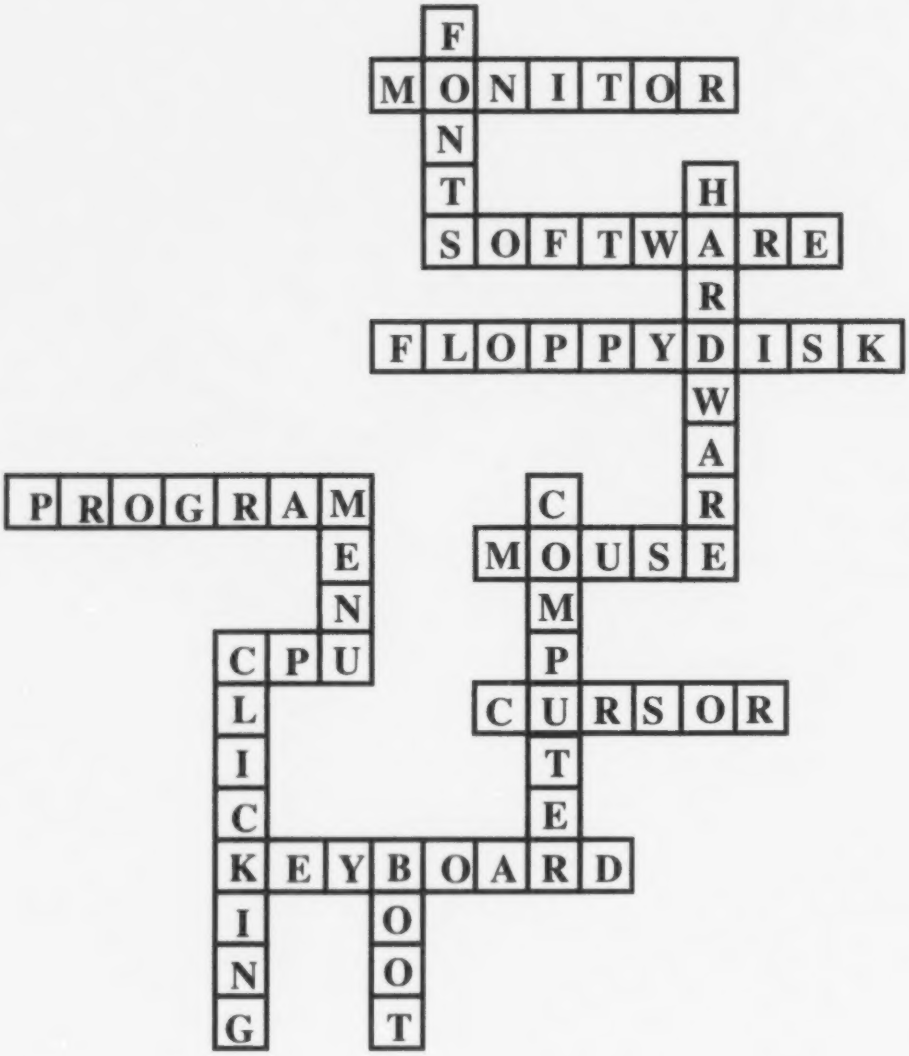
8) A device that accepts data, processes it, stores it, and displays it

10) Quickly pushing the mouse button once is called

13) A term that means to start your computer

**Courtesy of Joann Lyle, Landowne Jr. High School*

Crossword Puzzle Answer Key


FONTS
MONITOR
HARDWARE
SOFTWARE
FLOPPYDISK
PROGRAM
MENU
COMPUTER
MOUSE
CPU
CURSOR
CLICKING
KEYBOARD
BOOT

Tool #6: Parent Technology Survey

This survey is designed to help your school or district's Technology Planning Committee identify how it can plan and implement technology to support parent involvement in children's education. For each statement below, circle the number to the right that most closely corresponds with your interest level.

1 = no interest   2 = low interest   3 = some interest   4 = high interest

Response Item	Interest Level			
Set up a portable family technology resource center where parents can access and check out technology resources for educational purposes.	1	2	3	4
Develop a telephone tree or verbal message tree in which parent-community volunteers regularly inform other parents how to use the portable family technology resource center to enhance their children's learning achievement.	1	2	3	4
Collaborate with community members to arrange technology access off campus in familiar community settings such as libraries, churches, and/or museums.	1	2	3	4
Provide technical assistance to parents setting up a home computer and/or WebTV for Internet access to the school's Web site and/or wide area network.	1	2	3	4
Set up an online parent resource section on the school's Web site so that parents can get information about school activities. Include children's online homework activities, online access to staff e-mail addresses, curriculum projects, and school announcements.	1	2	3	4
Invite parents to become computer lab or classroom assistants so that they can get hands-on training and meaningful practice with technology while also helping students with learning activities.	1	2	3	4
Set up an online teacher-parent question-and-answer discussion area to facilitate ongoing communications among parents, staff, and invited guests.	1	2	3	4
Provide online communications that enable parents to send a prepared list of questions to the teacher ahead of time in preparation for face-to-face parent-teacher conferences.	1	2	3	4

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Tool #7: Parent-Community Needs Assessment Worksheet

The guiding question for the parent-community needs assessment is: *What does the parent-community need to help students reach essential learning outcomes?* The objective is to identify uses of technology to facilitate parental and community involvement aimed at helping students achieve essential learning outcomes.

Our vision statement specifies the following about *parent-community involvement:*

Our parent-community's *existing strengths* for achieving this vision are:

Our parents and community members face the following *primary barriers* to achieving this vision:

Key action strategies to help parents and community members overcome these primary barriers are:

Empowering *uses of technology* to facilitate and enhance parent-community involvement are:

Ways to *assess the impact* technology has on parent-community involvement are:

Tool #8: Partners in Learning With Technology Agreement*

We know that students learn best at ____________________________________ School when everyone works together to encourage learning. This agreement is a promise to work together as a team to help ____achieve in school. Together, we can improve the use of technology in teaching and learning.

As a STUDENT, I pledge to:

- Work as hard as I can on my school assignments and share with my parents what I am learning in school.
- Respect myself, my family members, and school staff members.
- Work collaboratively with my peers and other learners.
- Regularly use my public or school technology for educational purposes and observe all usage policies.
- Limit my TV watching, Internet surfing, and electronic game playing.
- Make time for reading, math, and other homework assignments.

Student signature ____

As a PARENT, I pledge to:

- Encourage good study habits, enforce quiet study time at home, and provide access to technology resources when feasible.
- Talk with my child every day about his or her school activities and use technology to communicate regularly with my child's teacher(s).
- Reinforce respect for self and others.
- Be aware of my child's progress in school by attending school events, reviewing schoolwork, and regularly visiting the Parents' Corner of the school's Web site.
- Volunteer my knowledge and expertise to enhance my child's school or district.
- Encourage good reading habits by reading to or with my child and by reading myself.
- Encourage technology skills development by using technology myself, and by helping my child use technology to complete homework tasks.
- Monitor my child's use of technology for entertainment and learning purposes.

Parent signature ____

As a TEACHER, I pledge to:

- Provide motivating and enriching learning experiences utilizing my school's technology resources.
- Explain my instructional goals and grading system to students and parents and post all homework assignments using accessible technology.
- Explain academic and classroom expectations to students and parents, and enforce all technology usage policies.
- Use technology to enhance two-way communication with parents about what children are learning in school and how families can enhance children's learning at home and in the community.
- Respect the uniqueness of my students and their families.
- Explore what technology resources can best help each child learn.
- Guide students and parents in choosing reading materials, TV programs, Internet sites, and educational software.

Teacher signature ____

As a PRINCIPAL/SCHOOL ADMINISTRATOR, I pledge to:

- Make sure students and parents are informed and welcomed to use the school's technology resources.
- Communicate the school's mission and goals to students and parents using the school's Web site.
- Offer a variety of ways for families to be partners in their children's learning and support those methods with appropriate technologies.
- Ensure a safe and nurturing learning environment, including electronic workspaces monitored according to the school's technology usage policies.
- Use technology to facilitate and strengthen partnerships among students, parents, and teachers.
- Act as a technology leader by supporting and modeling effective use of technology in classrooms.
- Provide teachers, families, and community members with opportunities for learning about technology and developing hands-on technology skills.

Most important, I promise to help each other carry out this agreement.

Principal/School Administrator signature ____

Signed on this ___________________ day of ___________________________________ in, ________.

*U.S. Department of Education. (1997). *Compact for Learning*. [Online]. Available at: www.ed.gov/pubs/compact/

Tool #9: Staff Needs Assessment Worksheet

The guiding question for the school staff needs assessment is: *What does the school or district's staff need to help students reach essential learning outcomes?* The objective is to identify your school or district's staff training and resource needs to effectively implement uses of technology to help students achieve essential learning outcomes

Our vision statement specifies the following about our *organizational staff:*

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Our organizational staff's *existing strengths* for achieving this vision are:

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Our organizational staff members face the following *primary barriers* to achieving this vision:

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Key action strategies to help our organizational staff members overcome these primary barriers are:

Empowering *uses of technology* to facilitate and enhance our organizational staff are:

Ways to *assess the impact* technology has on our organizational staff are:

Tool #10: Technology Proficiency Chart

Teacher teams can develop a technology proficiency chart on a grade-level or content area basis to identify the types of skill development and technology resources most pertinent to their daily practices. A technology proficiency chart should reflect the capacity of the building or district's technology infrastructure and include accessible technology resources. Create a Technology Proficiency Chart by naming the appropriate technology resource(s) for each of the four proficiency categories and by describing the corresponding levels of technology usage within each category, e.g. novice, intermediate, or advanced level of use. Use the definitions of the four proficiency categories and guiding questions below to complete the template provided.

At the building or district level, compiling proficiency charts from each grade level or content area helps provide the framework for a systemic professional development program aimed at helping teachers acquire the knowledge and skills to integrate technology into the curriculum. These charts also can serve as the basis for designing a technology mentorship program among staff. Aligning the charts from different teacher teams will ensure continuity of technology usage within grade levels as well as provide a continuum of usage across grades.

A completed sample chart can be found in Chapter 5, page 55, in this handbook.

Category Definitions and Guiding Questions

Basic Uses of Technology

Category Definition: Teachers acquire basic "know-how" skills for operating computer hardware, software, and ancillary equipment—such as scientific probes or telecommunications cameras—as well as troubleshooting abilities to address technical problems that may arise. The novice characteristically uses preset, surface toolbar features of technology to automate established practices. The intermediate user explores layered toolbar features of technology to increase productivity and efficiency. The advanced user customizes toolbar features to transform his or her daily workflow.

Guiding Questions: *What basic technology resources are appropriate? What are the uses of those resources at the novice level? the intermediate level? the advanced level?*

Instructional Uses of Technology

Category Definition: Teachers increasingly individualize their instructional practices with technology to support a variety of learner strategies to meet achievement standards. The novice begins to understand from a specialist how technology applications align with learning standards. The intermediate user consults with a mentor to successfully integrate technology in learner-centered ways that lead to overall standards achievement. The advanced teacher plays an active facilitation role within a community of learners using technology on an individualized basis to meet achievement standards.

Guiding Questions: *What instructional technology resources are appropriate? What are the uses of those resources at the novice level? the intermediate level? the advanced level?*

Administrative Uses of Technology

Category Definition: Teachers develop data-driven practices and manage individualized learning with the support of technology tools. The novice responds to mandated uses of technology for record keeping and scheduling. The intermediate user regularly enforces technology usage policies and draws on established management features of technology for monitoring and reporting students' progress as well as managing daily practice. The advanced user personalizes and/or creates technology tools for managing data-driven practices, helps develop usage policies, and models ethical technology practices.

Guiding Questions: *What administrative technology resources are appropriate? What are the uses of those resources at the novice level? the intermediate level? the advanced level?*

Professional Development Uses of Technology

Category Definition: Teachers use telecommunications and networked computers to access online courses and information resources as well as collaborate among colleagues. The novice begins to use technology as a supplemental resource for accessing professional information. The intermediate user accesses technology for up-to-date professional information and to communicate one-on-one with colleagues. The advanced user relies on a paperless, interactive information system for professional growth and purposeful collaborations among students, colleagues, mentors, parents, and business partners.

Guiding Questions: *What professional development technology resources are appropriate? What are the uses of those resources at the novice level? the intermediate level? the advanced level?*

Technology Proficiency and Levels of Use Template

Proficiency Criteria	Novice Level	Intermediate Level	Advanced Level
Basic uses of technology			
Instructional uses of software			
Administrative uses of technology			
Professionsl development ueses of technology			

Tool #11: Technology Resource Needs Assessment Worksheet

The guiding question for the technology resource needs assessment is: *What are the school or district's technology resource needs to empower students, parents, staff, and community members to achieve essential learning outcomes?* The objective is to identify the technology resources that need to be incorporated into the technology plan, budget, and implementation schedule.

Our vision statement specifies the following about *technology resources:*

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Our technology resources' *existing strengths* for achieving this vision are:

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Our technology resources present the following *primary barriers* to achieving this vision:

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Key *action strategies* to help overcome these primary technology resource barriers are:

Empowering *uses of technology* to facilitate and enhance our available technology resources are:

Ways to *assess the impact* our technology resources have on students, parents, community, and staff are:

Tool #12: Technology Resource Usage Policies Template*

The ____________________________ School District has defined its technology resources governed by the following usage policies:

Our individual network account rights and terms for termination are: __________________________________

____

____

Our group network account rights and terms for termination are: ____________________________________

____

____

Our electronic copyright and publishing policy states that: ____

____

____

Our acceptable content policy states that: ____

____

____

Our software licensing policy requires: ____

____

____

Our policy for governing technology security and dealing with vandalism is:: ________________________

____

____

Our policy for equitable scheduling and access to the district's technology resources is:: _______________

____

____

As a student at __________________, I have read, understand, and agree to abide by the district's technology resource usage policies.

Signed by student ____________________________________.

As parent/guardian of ___________________, a student at ___________________, I have read, understand, and agree to supervise my child's use of technology according to the district's technology resource usage policies during off-school hours. I hereby give my permission to issue a network account for my child with the understanding that my child is fully responsible for complying with the technology resource usage policies.

Signed by ____

on this ____________ day of ____________________, in _______

This form is a sample provided to assist technology planners in the process of formalizing their technology resource usage policies. It is not, however, a legal form. All technology usage policies should be finalized in accordance with the district's legal procedures and requirements.

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Example for Tool #12 Tomah Area School District, Tomah, Wisconsin Computer Resource Usage Policy

Definitions

Computer Resources: All networks (including connections to external networks i.e. Internet), processors, peripherals and supplies under the administration of the Tomah Area School District.

Computer Account: A computer resource user's unique ID which allows them access to specific computer resources.

Rights

Use of the Tomah Area School District computer resources is a privilege and not a right. As with all privileges, abuses will not be tolerated.

Inappropriate Usage:

Examples of inappropriate usage include, but are not limited to, the activities in the following list:

- Use a computer account that you are not authorized to use.
- Allow use of your computer account to another individual.
- Attempt to read, copy, change, or delete another user's files without the explicit agreement of the owner.
- Use the district network to gain unauthorized access to any computer system or network.
- Knowingly run or install a program on any computer system or network, or give to another user, that intends to damage or to place excessive load on a computer system or network
- Attempt to circumvent data protection schemes or uncover security loopholes on any computer resource within the district or connected to the district.
- Violate terms of applicable software licensing agreements or copyright laws.
- Deliberately waste computer resources.
- Use electronic mail or messaging services to send personal, threatening, harassing or abusive messages.
- Employ personal use during scheduled work time.
- Use computer resources for personal reasons that result in an expense to the district, or attend to other matters of a vocational nature not related to school business.
- Transmit or possess materials which explicitly or implicitly refer to sexual conduct.

Privacy

The computer resource administrators, in order to preserve the integrity or operational state of all computer resources, may find it necessary to manipulate, without prior consent, any data or files of any users that exist on any resource.

You should be aware that no computer security system, no matter how elaborate, can absolutely prevent a determined person from accessing stored information that they are not authorized to access. Thus, while the network tries to provide a reasonable level of confidentiality for information stored on the network, we cannot guarantee the privacy or confidentiality of any information stored on it. Therefore, if there is any information that must remain confidential, you should not store it on the network.

The Tomah Area School District reserves the right to read and/or remove any files on the system without prior notification to system users.

Internet Information Content

The Tomah Area School District has no control of the information on the Internet, nor does it provide any technological barriers to account holders accessing the full range of information available. Sites accessible via the Internet may contain material that is illegal, defamatory, inaccurate, or potentially offensive to some people. Access to any information on the Internet is ultimately the responsibility of the user.

Vandalism Policy

Due to the complexity and cost of technology within the Tomah Area School District, when any user's actions results in damage to any computer resource, all costs incurred for repair will be the responsibility of the user.

Due to the possible damages caused by diskette usage, no diskettes are to be placed in any computer without prior permission from the computer resource administrator or their designee. All diskettes not originating and being used strictly within the district must be examined by a virus-scanning program before being placed into any computer.

Software Installation

Only individuals assigned by the Tomah Area School District may install software (demo or full version) onto any computer resource within the district.

Computer Usage Policy Enforcement Guidelines

An individual's computer resource use privilege may be suspended immediately upon the discovery of a possible violation of the policies. Depending on the nature and severity of the policy violation, the district may take one or more of the following disciplinary actions:

- Verbal, written, or electronic mail warning.
- Probational usage and monitoring.
- Temporary access denial (account lockout).
- Permanent access revocation.

- Disciplinary school suspension.
- Alternative disciplinary action not involving access or usage restrictions.
- If warranted, the computer resource administrator will refer the case to an appropriate school, local, state, or federal authority for further disposition.

Demonstrated intent to violate policy will be considered the same as an actual policy violation. Demonstrated intent means evidence of actions, that if successful or if carried out as intended, would result in a policy violation.

Authorization For Use Of Computer Resources Within The Tomah Area School District

Student and parent/guardian signatures are required below prior to use of computer resources within the district.

As a student in the Tomah Area School District, I agree to abide to the district's policies regarding use of computer resources.

Student name: ____

Student signature: ________________________________ Date: __________

I have read and understand my responsibility as the parent or guardian for actions by the student listed above regarding computer resource usage.

Parent/Guardian signature: ____________________________ Date: __________

Tool #13: Technology Evaluation Rubric*

Review the list of indicators and highlight the portions of the rubric that best describe your school or district's technology implementation status. You can use this rubric over time to track and evaluate your progress toward achieving targeted needs and goals.

Indicators	1	2	3	4
Vision				
Development Awareness	No technology plan exists.	A technology plan is being developed with staff and community input.	A technology plan exists and efforts are being made to build staff, student, and broader community awareness.	Staff, community, and students help inform and implement components of the technology vision.
Technology Needs Assessment				
Students Parents and Community Staff	No needs assessment methods are conducted at the school site.	Staff is surveyed to determine hardware needs in their classrooms.	Needs for all technology user groups are assessed, but reporting and planning is not broadly shared with staff and community.	A districtwide technology needs assessment is completed yearly and aligned with schoolwide improvement criteria, plans, and progress reports.
Parents and Community Technology Literacy				
Systemic Instruction Varied Resources Equitable Access	Technology literacy skills are not taught. Technology resources are scarce with limited access.	Technology literacy skills are taught by some teachers. Technology resources lack depth and are not available to all students.	The school or district has adopted a technology literacy skills curriculum and many teachers use it. Technology resources are varied and comprehensive with access available to most students.	All staff systematically integrate technology literacy skills into instruction. Technology resources are comprehensive, providing all students with depth, diversity and regular access.
Curriculum Integration				
Lesson Integration Levels of Use Frequency of Use	One or more of the following are in evidence: • Technology is used as a reward for finished work. • Students use technology to practice things they already know. • Technology use is rare.	One or more of the following are in evidence: • Technology is sometimes used to support a lesson. • Students use technology for supplemental learning. • Technology is used an average of once a month.	Two or more of the following are in evidence: • Teachers often consider some technology tools when planning lessons. • Student technology use includes information gathering, organizing, and publishing in a variety of media. • Technology is used weekly.	All of the following are in evidence: • Teachers consider a variety of technology tools when planning. • Students use technology for information gathering, organizing, and multimedia publishing. • Technology use is part of daily classroom routines.

Adapted with permission from WestEd's Technology Implementation Assessment Rubric.

Indicators	1	2	3	4
Parental and Community Involvement				
Hands-on training Partnerships Access to Technology Infrastructure	Parents and community members are not involved in the school.	Sporadic and infrequent parent-community involvement exists in the school.	A parent-community involvement program exists, but does not provide regular support for and information about technology.	The parent-community integrates technology regularly through hands-on training, information services, and access to the school's technology infrastructure.
Professional Development				
Training	Technology training rarely occurs.	Some technology training is provided. No needs assessment was completed.	Technology training is provided. Needs are determined informally, and professional development is based on assessment findings.	Technology training occurs on an ongoing basis and follow-up support exists. All staff and partners are routinely asked to determine areas of need.
Paperless information system	Administrative systems are available for administrators only.	Administrative systems are available for administrators and some staff. Staff have not integrated them into regular practice.	Administrative systems are available for administrators and all staff. Some paperless systems are in place.	The daily use of the administrative systems is required for all staff and student guardians. Many paper reports are available electronically through a wide area network.
Technical Support	No technology support is available.	Sporadic technical support is provided by volunteers or part-time staff.	Technology support is provided by two or more of the following: • School-level technical staff • District-level technology coordinator • Technical consultants • A user group that meets occasionally to provide onsite technical assistance	Technology support is provided in a timely manner by: • School-level technical staff • District-level technology coordinator • A technology user group composed of teachers, students, parents, and community members who regularly provide leadership and hands-on assistance.

Indicators	1	2	3	4
Infrastructure				
Policies and Procedures	No technology policies and procedures exist.	Technology policies and procedures are in the process of being developed.	Technology policies and procedures exist. Efforts are being made to implement and educate staff and students about them.	Staff and students are informed about and are implementing technology policies and procedures. Software audits are conducted annually to ensure copyright compliance.
Networking	No network or Internet access exists. No network support exists.	Some networking or Internet access is provided. Volunteers or part-time employees provide network support and maintenance.	Networking and Internet access exists in some classrooms and libraries. Designated school staff support and maintain networks.	Networking and Internet access exist in all classrooms and other instructional spaces. The district supports and maintains networks.
Security	No hardware or desktop security is in place. No backup procedure exists.	Desktop or hardware security is provided sporadically. Backup procedures are lax.	The school or district has policies and standards for hardware and desktop security.	Hardware and desktop security standards are adopted and implemented throughout the building(s). Backup procedures are strictly adhered to and regularly monitored.
Standards for Hardware and Software	There are no standards for software or hardware in the school.	Software and hardware standards are being developed for use in the school.	Some standards for hardware and/or software have been adopted in the school.	Standards for hardware and software are used in the school and are reviewed regularly for continuity with curricular goals.
Funding				
Multiyear budget Partnerships Grants	Technology funding is sporadic and mostly from one-time money.	Funds for integrating technology into the school are limited on a year-to-year basis. No partnerships exist.	Technology funding is supported by regular, categorical and special program budgets. Partnerships are being developed. Funding from outside sources has been considered.	Permanent line items exist in regular, categorical and/or special program budgets. Ongoing partnerships exist. Funding from outside sources exists.
Innovative Practices	There are few opportunities for staff to pilot new hardware or software applications. No budget is available to promote pilots.	Some opportunities are available for staff to pilot new hardware and software applications. Minimal funds are available to support pilots.	Many opportunities are available to pilot new hardware and software applications. Some funds are regularly allocated to support pilots.	There is a systematic plan to pilot new hardware and software applications. Budget is routinely provided to support pilots.

Indicators	1	2	3	4
Evaluation				
Meeting Needs and Goals	No assessment or evaluation strategies are in place in the school or district.	Some teachers assess their students' and their own uses of technology quantitatively.	Quantitative schoolwide assessment of student and staff uses of technology is conducted, and results are used to refine the schoolwide technology plan.	An annual report quantitatively and qualitatively outlines results from schoolwide uses of technology to refine the school improvement and technology plans.
Learning Outcomes	Outcomes from technology uses are unidentified.	Outcomes are not directly attributable to technology usage.	Some indication of technology-enhanced learning outcomes is reported in teacher records.	A clear correlation between learning outcomes and technology usage is well documented throughout the school or district.

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